

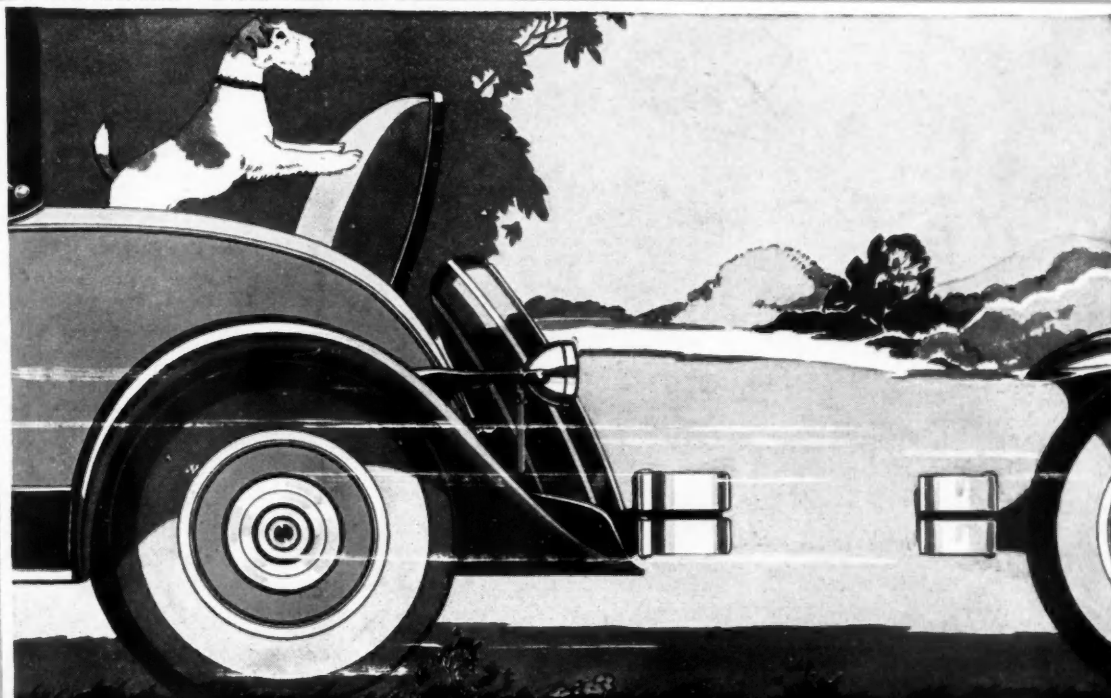
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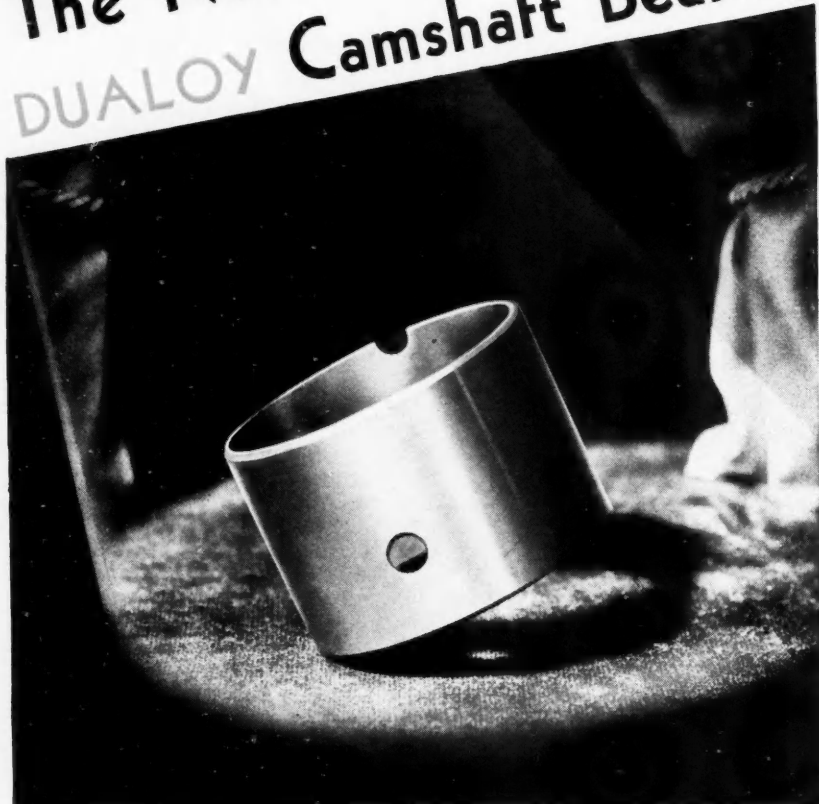
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AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Vol. 64

Reg. U. S. Pat. Off.

No. 19

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Contents

Nation's Business Leaders Hear Reverberations of Tariff Protest. By Leslie Peat	715
Rear-Mounted Engines Would Bring Renaissance in Body Design. By P. M. Heldt	718
Production and Overhaul Testing Combined With Research Laboratory. By Ralph N. Dubois	723
Weight Efficiency of Batteries Has Increased 200 Per Cent Since 1912	727
Industry's Leaders Protest to Hoover	729
Just Among Ourselves	730
Autogiro Attachments as Standard Units Now Available for Ships Up to 4000 Lb. By Joseph S. Peek	732
Production Lines	735
Graham-Paige "Prosperity 6" Bids for Sales in Lower Price Group	736
New Developments	738
Automotive Oddities	740
News of the Industry	741
Calendar of Coming Events	750
Advertisers' Index	82-83

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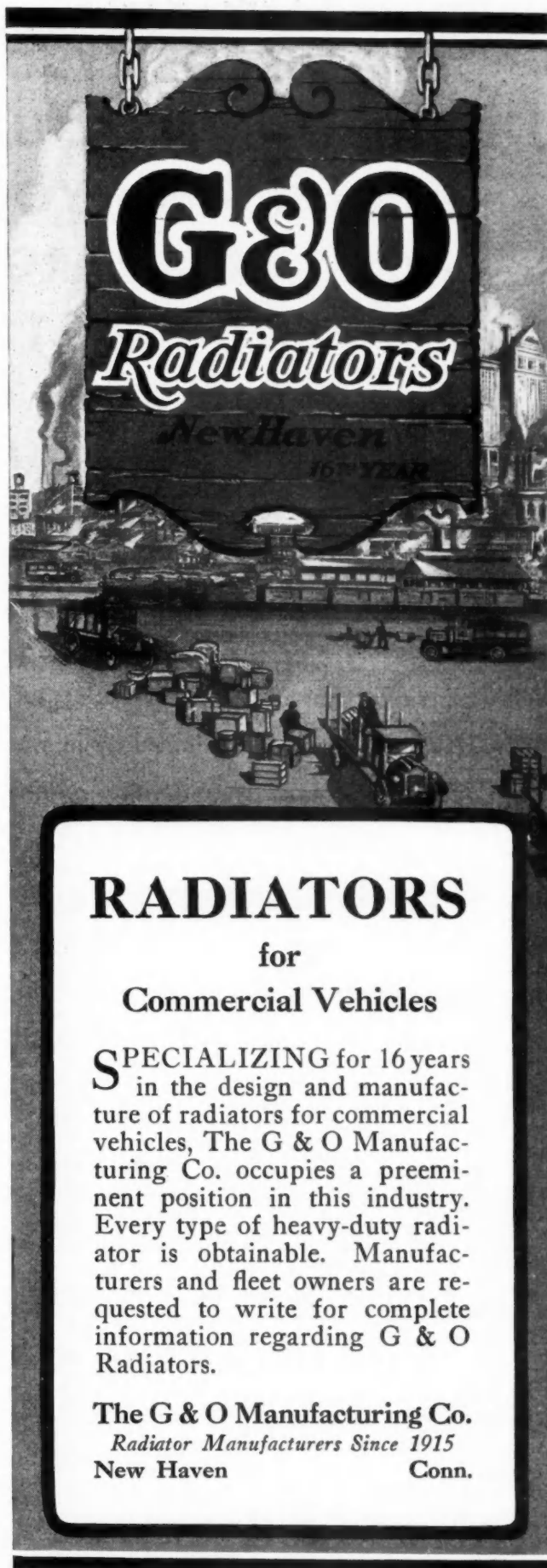
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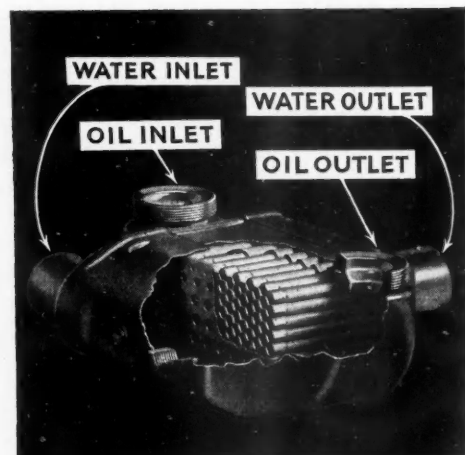
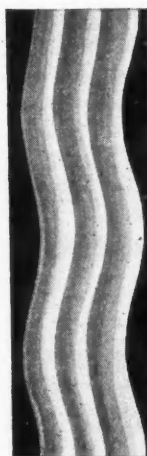
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May 9, 1931

Automotive Industries



Nation's Business Leaders Hear Reverberations of Tariff Protest

by Leslie Peat

JUST as delegates representing export interests had begun to feel hopeless of any action which would put the Chamber of Commerce of the United States on record for tariff revisions, Julius H. Barnes, chairman of the chamber, vigorously attacked the Hawley-Smoot bill at the closing session of the meeting at Atlantic City on May 1.

Mr. Barnes told the delegates at their annual dinner in Atlantic City that reductions on the Hawley-Smoot rates would aid revival of business by encouraging foreign trade.

Earlier that day the nineteenth annual meeting of the chamber failed to act upon the tariff suggestions made at the round-table discussions Thursday afternoon, when Robert C. Graham, vice-president of Graham-Paige Motor Co., and chairman of the Foreign Trade Committee of the National Automobile Chamber of Commerce, presented the case for car manufacturers, urging speedy reductions of tariff rates on such commodities as would encourage reductions of import duties on automobiles in certain countries abroad.

In spite of the drop in the market prices of cotton, wheat and other commodities throughout the world, Mr. Graham said, car manufacturers would now, except for tariff barriers, be able to deliver automobiles at only a slight increase in the number of bales or bushels of these commodities over what was the case about 18 months ago.

"Packing methods have been improved, shipping



Robert C. Graham, who told delegates attending the 19th annual meeting of the Chamber of Commerce of the U. S. how the "tariff cost factor" has defeated economies effected by the automobile industry + + + + +

costs reduced and other economies devised to hold down the price of automobiles in relation to the purchasing power of our foreign markets," Mr. Graham continued.

"The reestablishment of this equilibrium between the exchange values of automobiles and other products would ordinarily have been sufficient to bring about renewed circulation of goods with resulting prosperity," he said, "except for the new 'cost factor' resulting from our present status of international relationships.

"Tariff charges abroad have been so large that in most cases they have more than overcome the price advantages the industry has created through economical manufacturing and shipping."

Any excessive duties imposed by a foreign country on an automobile immediately tends to remove this vehicle from the buying reach of the masses; its price to the ultimate consumer must be raised, and an increased amount of other people's commodities must be exchanged to obtain a car.

"Thus," Mr. Graham pointed out, "the automobile starts to lose its economic equilibrium."

This "tariff cost factor" he said, has brought about:

1. Discriminatory raising of import duties of American cars *only*.
2. Indirect discriminations which are brought about by licensing systems and roundabout



Julius H. Barnes, who, in his address at the annual banquet of the Chamber, spoke for lower tariffs in this country as a method to induce foreign nations to reduce their import restriction on U. S. manufactured products + + +

rate structures of various kinds, arbitrary customs valuations, regulations and internal taxes which favor cars manufactured in other countries over those built in the United States.

3. Preferential duties brought about by foreign countries in agreements between themselves. (Such agreements cannot be entered upon by the United States under present laws.)

4. High automobile tariffs of some countries, which seem legitimate in themselves, but which are excessive in view of the favorable treatment that their principal products receive in this country.

What was, perhaps, the most lively controversy at the convention had to do with the stabilization of business and employment. The subject had an important place on the program. When it was learned, however, that Senator James S. Couzens, proponent

Stabilization of Employment

We commend and endorse the appointment of the special committee of the Chamber of Commerce of the United States for continued study of the possibilities of business and employment stabilization.

This study should include means for relieving such unemployment distress as may unavoidably occur from time to time, including a rational program of production and distribution to be initiated by business itself.—Resolution passed by the Chamber of Commerce of the U. S.

May 9, 1931

of maintaining a high wage, was absent, the subject lost some of its spectacular aspects.

The Senator from Michigan, whose long connection with the Ford Motor Co. makes his opinions particularly interesting to automotive men, recently disagreed with a proposal made by Mr. Barnes, who advocated "spreading out the payroll by increasing the number of employees."

Most of the controversy took place in hotel corridors and lounges, as the set speeches of the program had little interest to offer as compared with the livelier expectations of the delegates. The convention approved the naming of a committee to continue the study of business and employment stabilization.

Mr. Barnes' statement was somewhat modified when he told the delegates that "Business judgment, invested with the responsibility of conducting industry, realizes that its chief duty rests in the maintenance of employment for the 40 millions engaged today in productive earnings, as well as in efforts to

Motor Bus Regulation

No federal or state regulatory authority now has jurisdiction over interstate commerce by motor bus.

Such commerce has become an important part of the commerce among the states. Congress should accordingly enact legislation for regulation of motor buses engaged as common carriers in interstate commerce.

—Resolution passed by the Chamber of Commerce of the U. S.

Financial Responsibility Laws

The National Chamber has heretofore expressed its opposition to the principles of compulsory automobile insurance.

The Chamber, however, recognizes the basic principles involved in the so-called financial responsibility laws as equitable and conducive to improving safety conditions on our streets and highways.—Resolution passed by the Chamber of Commerce of the U. S.

reabsorb the five millions who are now out of work."

The convention reiterated its previous position in regard to government in business by passing several resolutions denouncing "governmental competition with private business," and attacking political violations of "business judgment."

"The province of the government is not to supplant, but to supplement individual effort and to preserve the fair field. It must not legislate with suspicion and restriction," Mr. Barnes told the convention.

As for the past several years, the government came in for some harsh criticism in regard to taxation and

Automotive Industries

Street and Highway Traffic

Uniformity in traffic laws and regulations is of widespread interest by reason of the country-wide movement of motor vehicles.

The National Conference on Street and Highway Safety, in the light of the latest experience, has revised the uniform standards it proposes, has perfected its uniform vehicle code, which has the endorsement of the National Conference of Commissioners on Uniform State Laws and of the American Bar Association, and has brought forward a model municipal traffic ordinance.

All of the measures proposed by this conference should receive most careful consideration from business men's organizations and from all public authorities that deal with problems in the field of street and highway traffic.—Resolution passed by the Chamber of Commerce of the U. S.

P. W. Litchfield, veteran head of Goodyear Tire & Rubber, who was chairman of the session on Stabilizing Industrial Employment ++



administration of laws controlling industry, finance and commerce. Several resolutions were passed by the convention in support of the principle that the government should not interfere with business. Dwelling on the phase of governmental competition, Fred W. Sargent, president, Chicago & Northwestern Railway Co., made a brilliant case for the carriers, which, he said, face a terrific handicap because of present laws designed to promote government-built canals. He pointed out that the postoffice was a direct competitor of railroad express agencies in prac-

tically all classes of commodities.

The subject of the high cost of government—federal, state, county and local—brought to their feet a number of important business men who had undertaken to discuss these problems. Arthur H. Ballantine, Assistant Secretary of the Treasury, pointed out that with the present size of the public debt, part of which resulted from the late war, and the ever-increasing functions of government legislated by a Congress, some drastic change of policy must be undertaken if taxation is to be appreciably decreased.

Brief Summary of 25 Resolutions Adopted by Chamber of Commerce of the U. S.

To continue the study, by a special committee, of business and employment stabilization (see page 716).

Commendation of the "trade practice conference" between the Federal Trade Commission and industrial organizations.

Opposition to participation by the Federal government in any business enterprise in competition with its citizens.

A request that Congress authorize the Federal Trade Commission to "receive, approve and enforce, under judicial review," agreements between business men to eliminate waste and abuses in their competitive relations.

Urging the Federal Trade Commission and the Department of Justice to develop and continue a common policy in their relations to business.

Calling upon the directors of the chamber to give further study to the proper revision of the anti-trust laws and to submit their recommendations for action by the chamber in a referendum.

A demand for retrenchment in governmental expenditure and the extension of proper budgetary and accounting systems in the disbursement of revenue from taxation.

A call for study of the effect of taxation on the cost of living, to be made by a committee of the chamber, the results of which are to be made known to the public.

Commendation of the policy of the United States Treasury in using interest payments received from foreign governments toward meeting our own government interest obligations, rather than the reduction of the federal debt.

A call upon the federal government to seek reciprocal agreements with foreign countries for the relief of taxpayers from international double taxation.

Urging a material reduction in present levy upon capital gains by the Federal income tax.

Opposition to the sales tax by states.

A call upon the International Chamber of Commerce to continue the study it is making of the silver problem, "to the end that it may as quickly as possible bring to bear on these problems an international business judgment."

Approval of the law banning imports which would subject American industries to unfair competition from abroad and the enactment of further law to the same end where it is shown to be needed.

An expression of the desirability of a conference on transportation problems representative of all interests, including the users of transportation, to be arranged by the chamber.

Urging continuation by the government of its efforts to get out of the shipping business, calling upon American shippers and travelers to support the American

merchant marine with foreign shipments.

Urging enactment into American law of The Hague rules on uniform ocean bills of lading, with the amendments adopted by the conference on uniform traffic laws.

Opposition to compulsory automobile insurance. (See page 716.)

Urging early completion of engineering work by Canada and the United States to extend an international highway to Alaska.

Advocating early construction by the federal government of approach roads to national parks.

Reaffirming the chambers' indorsement of trade associations and calling on business men to support properly organized associations.

A call to American firms doing export business and having representatives abroad to support Chambers of Commerce in foreign countries.

Urging Congress to enact legislation for the regulation of motor buses. (See page 716.)

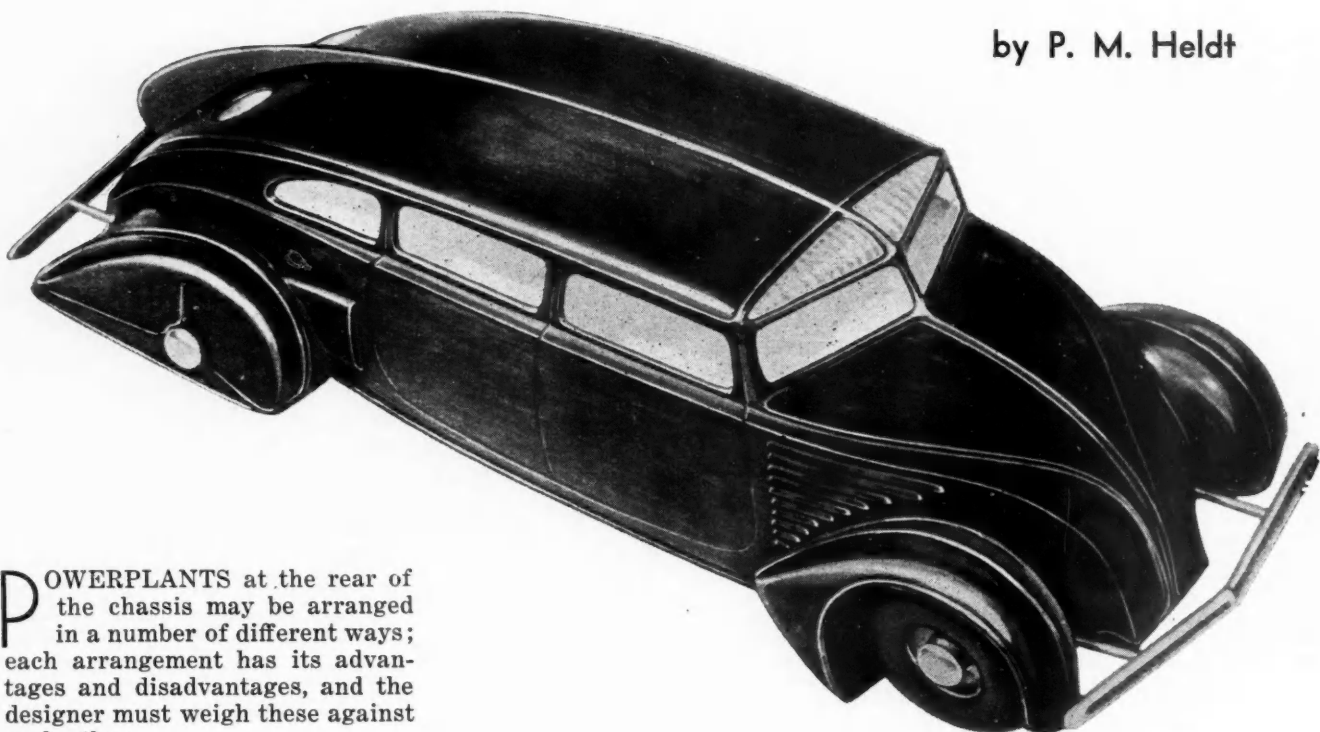
Urging the giving of wider power to municipalities for the establishment of airports; advising further governmental expansion of the air mail service, and the enactment of laws to promote dirigible airship service overseas. A call for proper supervision of flying contests.

Endorsing uniformity in traffic laws. (See page 717.)



Rear-Mounted A Renaissance

by P. M. Heldt



POWERPLANTS at the rear of the chassis may be arranged in a number of different ways; each arrangement has its advantages and disadvantages, and the designer must weigh these against each other.

If we wish to use the conventional powerplant, consisting of a multiple-cylinder in-line engine and a clutch housing and transmission bolted to same in direct extension of the crankcase, it is necessary to mount the engine with its crankshaft extending in the fore and aft direction, for the length of the powerplant will be too great to come within the permissible width of the chassis. For instance, a powerplant with eight-cylinder in-line engine of $3\frac{1}{4}$ in. bore has an over-all length of about 62 in., or several inches more than the wheel tread. There are then two possibilities—the engine may be either forward of the axle or behind it. In each case, of course, it is desirable to have the transmission on the opposite side of the axle from the engine, because if the whole powerplant were ahead of the rear axle an abnormally long wheelbase would be required, since the wheelbase in that case would have to be equal in length to the passenger compartment, plus the length of the powerplant. If the powerplant were mounted back of the axle the wheelbase could be short, but there would be a great overhang over the axle, which would place

Sterkenberg car designed by John Tjaarda. This is a later design than that of which a sectioned drawing was shown in the preceding instalment + + + + +

practically the whole weight of the car on the rear axle, and with a light load, as, for instance, with a single person in the car, it might leave insufficient weight on the front axle to assure positive steering.

Location of the engine and transmission on opposite sides of the driving axle is possible with both worm-gear and hypoid-gear final drive, and it would certainly be advisable to use one or the other of these forms of drive. Moreover, it is necessary to have the differential and final drive spring-suspended and to compensate for the vertical motion of the differential relative to the wheel axles by providing the axle shafts with universal joints or by using oscillating axles.

Even with only the engine in front of the rear axle it seems desirable to keep its length down as

Engines Would Bring in Body Design

This is the third of a series on rear-mounted powerplants. In this article the author discusses the subject from the viewpoints of the engineer and the body designer

much as possible, because this permits of a better location of the seats relative to the axles, and a V engine therefore would seem to be preferable to an in-line engine for this arrangement. Support is lent to this viewpoint by the fact that of the various cars with rear-mounted engine having the engine arranged in the car axis and ahead of the front axle, the Rumpler had a W engine and the Moglia a V type. In the Claveau a four-cylinder opposed engine was used, but it is somewhat doubtful whether any American manufacturer wishing to develop a rear-engined car would consider an engine with as few as four cylinders. Cars of advanced design naturally appeal most to customers who want something outstanding all around, and who can afford to pay for it, and this class would hardly be satisfied with a four-cylinder engine.

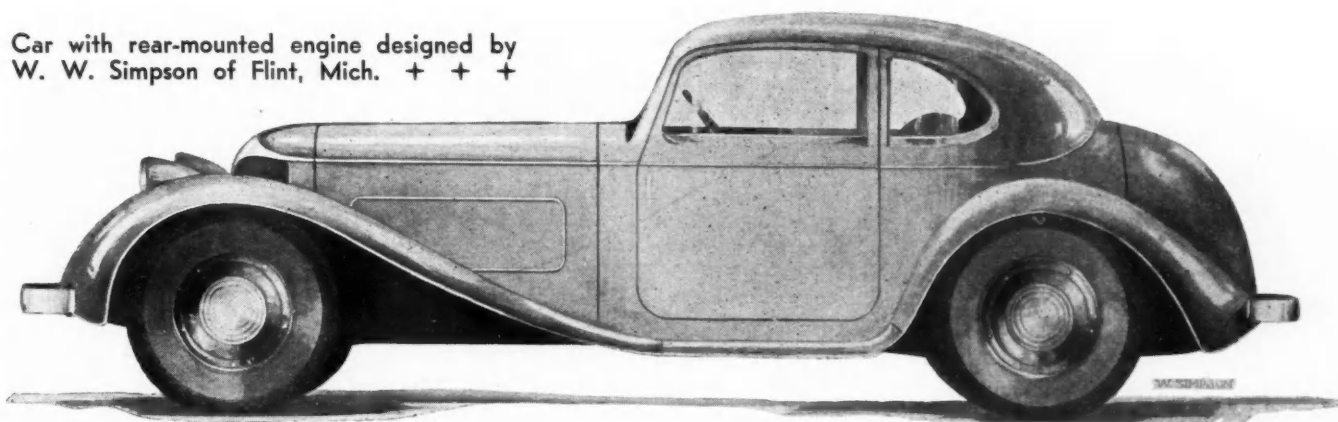
The objection to this arrangement of the engine is that it is almost impossible to make it accessible. Of course, the engine would be covered with a hood, but even with this removed, access to it from the rear would be hampered by the rear axle and trans-

mission, as well as by the rear extension of the body; access from the sides, by the wheels and fenders. The engine, of course, would have to be placed entirely back of the rear seat, because a vertical engine under the seat would necessitate a high seat and lead to excessive overall height.

Instead of mounting the engine forward of the rear axle, it may be placed back of same. This, of course, permits of excellent access to the powerplant, even better than in the case of a front-engined car, for there is no axle in the way. This arrangement lends itself well to a design in which complete streamlining is aimed at, because it necessarily calls for a considerable extension of the chassis behind the rear axle, and the body can be brought down gradually to a point or sharp edge, as required for streamlining.

One of the problems that has to be solved in connection with any rear installation of the engine is that of providing an adequate air current for carrying off the surplus heat. At the front the radiator is undoubtedly in the most favorable place, for it is

Car with rear-mounted engine designed by
W. W. Simpson of Flint, Mich. + + +



there exposed directly to the air currents produced by the motion of the car, and at high car speeds very little power needs to be used in driving the fan. Now that the engine is located in the rear does not necessitate placing the radiator there; the latter can still be kept in front if the advantages of its location there are considered to outweigh the associated disadvantages. A front radiator combined with a rear engine is nothing new, for many of the earlier cars had this combination, and it is used also in one of the modern rear-engined cars, the Trojan.

The advantages of a front-mounted radiator would seem to be that for a given cooling capacity a smaller core can be used, and there also will be less need for a powerful fan. In the front, moreover, the radiator does not interfere with access to any of the mechanism. The disadvantages are in the longer connections from and to the cylinder block, and in the difficulties connected with driving a fan behind a front-mounted radiator. Undoubtedly the longer the pipe connections and the more numerous the joints in same, the greater are the risks of leaks developing in the cooling system. Slightly greater pumping power is required to force the water through the longer circuit, but this need not cause any worry. A more troublesome problem is that of the fan drive. The cars of the early period that combined front radiators with rear-mounted engines had powerplants of such modest capacity that no fan was needed. A mechanical drive with a shaft extending underneath the frame could be arranged, of course, but would be considerably more complicated than that now used. There is also the possibility of using electric motor drive for the fan, which might be combined with thermostatic control for the sake of current economy.

If the radiator is mounted at the front, special means would have to be provided to insulate the driver's compartment against its heat, as otherwise one of the advantages of rear-mounting of the powerplant would be lost. This can be readily accomplished by providing a deflector behind the radiator which turns the current of air coming through the radiator downward before it has

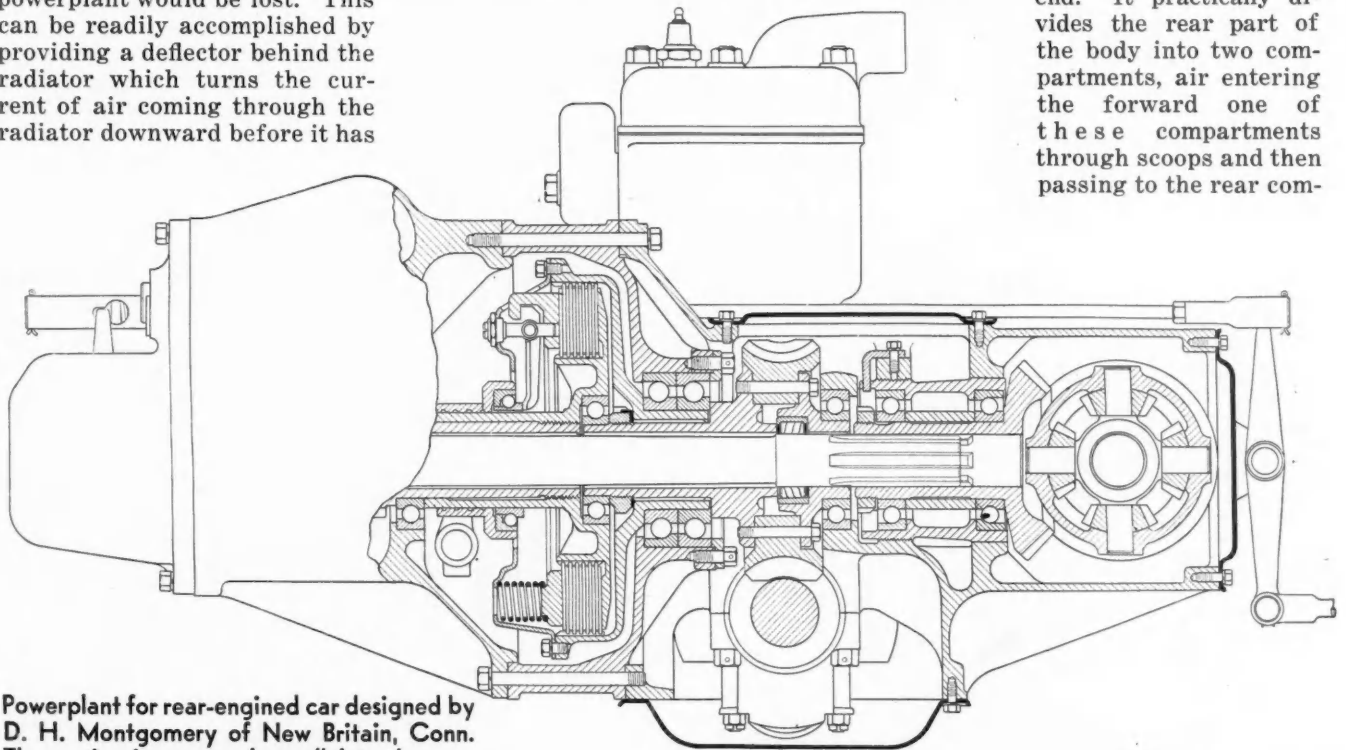
a chance to come in contact with the instrument board and footboard of the front compartment.

The majority of designers of cars with rear-mounted powerplants seem to consider, however, that the radiator should be located at the rear, close to the engine. Now, in a streamlined car—which a car with rear-mounted powerplant is naturally supposed to be—the body lines must be such that the air passes smoothly over its surfaces. It would therefore be out of the question to mount a radiator outside the body in the air stream, as that would result in turbulent flow and add materially to the air resistance of the car as a whole. Moreover, it is difficult to get air into the body to cool a radiator on the inside. On the Burney car air scoops are provided over the wheel houses, and the use of some sort of scoop seems to be unavoidable. If placed either on the sides or on top, such scoops will hardly add to the attractiveness of the vehicle, and with the tendency to place floorboards close to the ground it is doubtful whether air could be effectively scooped up from underneath the chassis without running the risk of constant injury to the scoop.

Location of Radiator

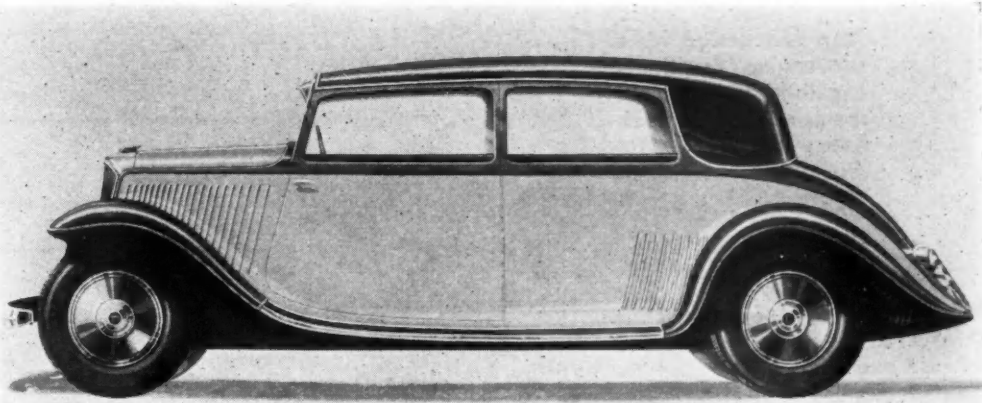
The exact location of the radiator, if at the rear, is also a difficult problem, for it must not interfere with access to the engine. One of the best positions would seem to be to the rear of the engine, where it could form a cross wall in the tapering body extension, from which latter the air coming through the radiator would be discharged through louvers. On the other hand, with a constant flow of air from an opening of suitable size in the rear of the body it is not necessary that the body should come down to a point or a line in order that its air resistance may be low, for it is impossible for vacuum to form. The opening, could be covered with a suitable grating.

In one design the radiator is made in halves located on opposite sides of the engine at its forward end. It practically divides the rear part of the body into two compartments, air entering the forward one of these compartments through scoops and then passing to the rear com-



Powerplant for rear-engined car designed by D. H. Montgomery of New Britain, Conn. The engine is arranged parallel to the rear axle and connects to the transmission through a worm gear located at its center

A more recent design of rear-engined car by John Tjaarda which departs very little from the conventional in general appearance + +



partments, air entering the forward one of these compartments through scoops and then passing to the rear compartment through the radiator. This scheme, however, would hardly be applicable to cars having the engine mounted in front of the rear axle, in which case it will be immediately back of the passenger compartment.

It would also be possible to mount the radiator below a fixed sloping rear deck over the engine, and the radiator, with a screen over it, could even form this rear deck or a portion of it. It would be rather difficult to mount a fan back of such a radiator, but the problem might be solved by completely enclosing the engine space and mounting the fan over a circular air inlet into same. This again would lead to complications in the fan drive.

Aside from the possibility of placing the engine with its axis in or parallel to the longitudinal axis of the car, we have that of locating it transversely, either in front of or behind the axle. This scheme is now being employed by two manufacturers in Europe (by one in connection with a front-driven car), but in each case the engine has only two cylinders. If an engine with more than four cylinders were to be placed crosswise on the frame it would be impossible to mount the transmission in line with it, as the length would become too great. The transmission, of course, could be placed parallel with the crankcase, but this necessitates continuous transmission of all of the engine power through a train of gears or through a toothed chain and a pair of sprockets.

If the transmission is placed in line with the engine only a single chain or gear train is needed, whereas if engine and transmission are located side by side, two such drives are required, one for transmitting power from the engine to the transmission, and the other for taking it from the transmission to the axle. This, of course, reduces the efficiency of the drive, besides adding to the first cost. Another solution of the problem is employed in a design due to D. H. Montgomery of New Britain, Conn., who takes the power from the middle of a cross-mounted engine by a worm drive and places the transmission at right angles to the engine in the axis of the car. Mr. Montgomery's powerplant is illustrated herewith.

It is quite conceivable that if the buying public should react favorably to the introduction of the first rear-engined cars, other types of engines besides those now used in automobile construction would receive consideration from designers. That the vertical in-line and the V types are used exclusively for automobiles at present is undoubtedly due to the fact that they are best suited to the space conditions in conventional modern cars. If the

engine were to be moved to the rear, space conditions, of course, would change to a certain extent. Cars have been built in the past with revolving cylinder engines and stationary radial engines under a rear deck—the former by Adams-Farwell of Dubuque, Iowa, some 25 years ago; the latter by North-Lucas in England more recently. North in his design was apparently influenced somewhat by Rumpier, for the lower part of the closed body was boat-like in shape. In general appearance this car was rather attractive, but the body was perched rather high even for those days. This probably resulted from the vertical arrangement of the engine crankshaft, which latter would seem to make it necessary to sacrifice either lowness of the center of gravity or the direct drive to the final reduction gear.

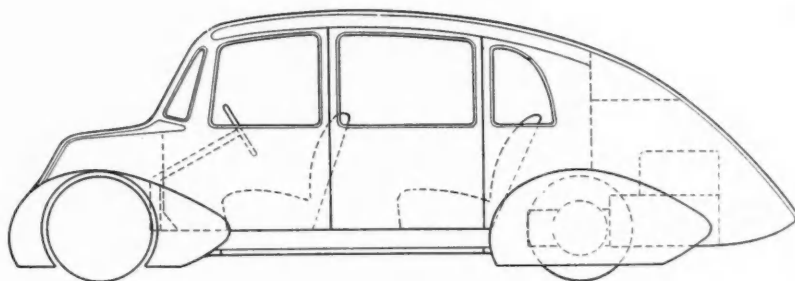
The use of horizontal opposed engines is also within the range of possibility, particularly of eight-cylinder engines, which can be completely balanced and occupy no more space in the fore and aft direction than an eight-cylinder V engine. The proper arrangement for such engines also would be to have them on one side of the driving axle and the transmission on the opposite side.

Horizontal Engine May Return

It may appear that the horizontal engine is an obsolete type and could not be resurrected, but it must be remembered that what rendered it obsolete chiefly was that it did not fit into the space available under a hood in front and that with splash lubrication it was practically impossible to supply equal amounts of oil to the cylinders on opposite sides of the crankshaft. Naturally, if an opposed horizontal engine were placed in the rear, an approach to a streamline form of body would have to be made by sloping the roof down to a sharp horizontal edge, in which case the rear end of the body could be made plenty wide to accommodate this type of engine. Access to the cylinder heads and such accessories as the carburetor and ignition unit could be had through doors in the side of the body, and though the accessibility would not be exceptional, it probably could be made satisfactory. One advantage of this type of engine would be that it would lower the center of gravity of the car as a whole, as compared with a vertical engine.

Rear mounting of the engine involves many of the same problems that come up in connection with front drive, for the reason that the relation of the powerplant to the driving axle is the same. There

Proposed design for a rear-engine car with the engine located back of the axle and the wheels faired to reduce wind resistance + + +



being no long propeller shaft in either case, the relative vertical motion between the powerplant and the wheels can be compensated for only by jointing the rear axle shafts, and the most practical plan seems to be to mount the differential with its drive gear on the frame and employ jointed axle shafts. Whether or not this arrangement should be combined with independent springing of the rear wheels is open to question, but the independent springing system will commend itself in most cases, for if a rigid "through" axle were to be used it would have to pass under the driving-gear housing and would generally reduce the road clearance more than would be permissible. Using a spring-mounted driving-gear housing permits of building the entire powerplant, including the so-called final drive, in a single unit, as is customary for front-drive cars. Provision for hand cranking and for the drive of the radiator fan in most cases will involve greater difficulties than the corresponding problems in a conventional car with the powerplant in the front, but these problems can be solved in a satisfactory manner.

Perfect Streamline Improbable

One thing that will make it difficult to get anything approaching a perfect streamline form in an automobile body is the need for free vision for the driver. Even in some of the present cars the depth of the windshield is quite small and the engine hood high as compared with the driver's seat, and long, so that the field of vision is restricted. Some day, of course, the whole front of the car may be made in the form of a dome or spherical sector of some transparent molded material, but for the present we will have to figure with a plane windshield. As the height of this windshield is reduced to cut down the air resistance, the field of vision of the driver is reduced. In most cases front glasses greatly inclined to the vertical have been used, to effect a reduction in the air resistance, but at least one maker has discarded them again, and the inference seems justified that drivers found them unsatisfactory. A moderate inclination of the windshield does not interfere with the vision, but when the inclination is as much as 45 deg., vision seems to be unfavorably affected, especially if the vertical height of the glass is reduced at the same time.

One of the advantages claimed for rear-mounted powerplants is that they keep engine noises away from the occupants of the car. This, of course, is a minor advantage which could hardly be relied upon to carry the rear-mounting feature into popularity, in view of the fact that our modern engines generally are so silent in operation that there are no grounds for complaint on this score. In the case of old engines, of course, the occupants might be thankful to be spared annoyance from their rattles, but, on the other hand, if there should be any unusual noises due to incipient defects in the engine,

it would certainly be better to have the latter in such a position that the driver could distinguish the noises clearly while the car was in motion. This applies also to engine knocks. With the driver seated in front and the engine mounted at the rear it would be difficult to detect ordinary cases of "pinging." But perhaps an instrument could be developed comprising a transmitter mounted in the engine compartment and a receiver convenient to the driver, which the latter could switch on whenever he desired to check the operation of the engine by sound.

Among the least attractive features of cars with rear engines is that all controls must be carried from the rear-engine compartment to the driver's compartment in front. This includes connections to the throttle, choke, ignition unit, clutch and transmission. Also, many of the electrical connections must be appreciably longer, and this is of importance, particularly in connection with the cable between the starter and the starter switch, because with long cables the voltage drop in them increases and the starter torque is correspondingly reduced. A remote-control starter switch would obviate the need for longer cables, but would add one more control rod. Gear shifting mechanisms of the indirect type, such as used on front-drive cars, have to be used. On the whole, the number of control links, levers and joints will have to be increased considerably, with increased opportunities for the development of rattle and for disarrangements. The connections, moreover, must be carried forward underneath the car, where they are particularly hard to get at.

Instability is Factor

One of the weakest features of the rear-engined car when considered as a vehicle for really high-speed travel, is its tendency toward instability. With present-day cars, under all normal conditions of driving, stability of motion is assured by adherence between the tires and the ground. At very high speeds, however, the car takes on to a certain extent the characteristics of a projectile. There are two forces acting on a body moving freely through the air like a projectile, and the relation to each other of the centers of application of these forces determines whether the motion of the body is stable or not. The first is the force of inertia, which keeps the body in motion. This force is centered at the center of gravity of the body. The second force is that of air resistance. To assure stable flight of a body, its center of gravity must be located forward of its center of air resistance when the axis of the body deviates slightly from the direction of motion. A good example of a body that is stable in flight is an arrow. To assure stability of motion we provide the arrow with a metal tip, thereby bringing the center of

(Turn to page 746, please)

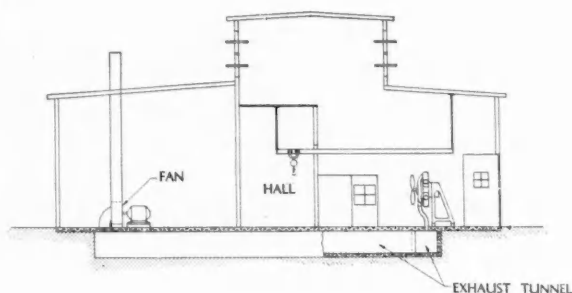
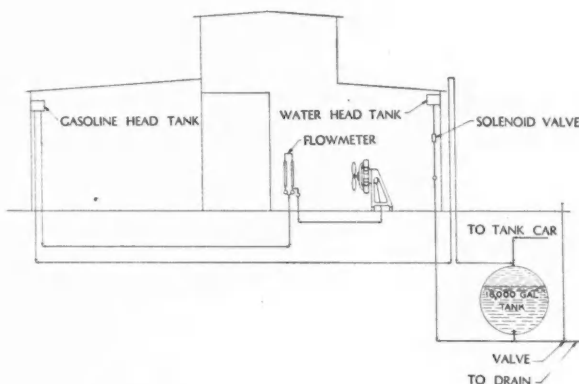


Fig. 2—Cross-section through laboratory + +

Fig. 3—Fuel supply system of Continental laboratory



in the line from the main tank, at a height sufficient to prevent flow of water over it should the tank be emptied of gasoline. The fuel level in the tank is read by a float that is weighted sufficiently to sink through the gasoline and float on the water surface.

An electric circuit operated by a relay at the gasoline float tank closes the solenoid-operated valve in the water line should the flow-out of the tank exceed a certain amount. The chief disadvantage of the system is the necessity of shutting off the laboratory fuel supply while filling the tank. Advantages are lack of gasoline evaporation and freedom from dirty gasoline, the sludge remaining in the bottom of the tank, from which it is flushed out with each filling.

Each of the five production and endurance test rooms is 15 by 25 ft., and has set in the floor a 6 by 10 ft. reinforced concrete foundation block, which is insulated from the rest of the building. The use of calibrated propellers on production tests has proved quite satisfactory. The calibration of each propeller is checked periodically on engines just removed from the dynamometer test stand, where the power was carefully determined. Inertia starters are used for A70 engines, while the little A40 engines are started by "pulling through."

One observation room serves two test rooms, the diagonal window enabling the personnel to conduct tests in two rooms concurrently. One test mechanic can operate the two stands during endurance runs. Double flowmeters in each observation room give a continuous indication of the fuel flow to each stand. Oil is circulated by the engine pump through a copper-coil temperature regulator with the customary provi-

sion for a steam or water supply. The regulator serves chiefly to keep the oil warm, as the heat loss through the crankcase and external stand piping is sufficient to require the use of steam at all times.

Controls in the observation room are of the three-unit Army B-3 type. After a year of experimenting with various flexible control cables, a Bowden type using a 0.080-in. piano wire inclosed in a 1/4-in. brass tube was adopted. Special guide fittings were developed for the ends of the wire, which insure smooth operation, without kinking or bending.

For routine checking of manifold vacuum during production running-in and endurance tests, a 3/16-in. steel plate is placed between the carburetor and the engine and connected to a mercury manometer. A curve of manifold vacuum vs. engine r.p.m. is determined for each test propeller, and serves to assure the test mechanic that the engine is developing the required power for each throttle opening during the breaking-in process.

Fig. 4 shows the arrangement of the "air-

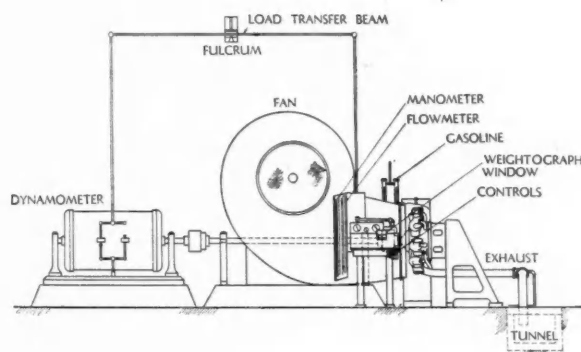


Fig. 4—Air-cooled dynamometer room + +

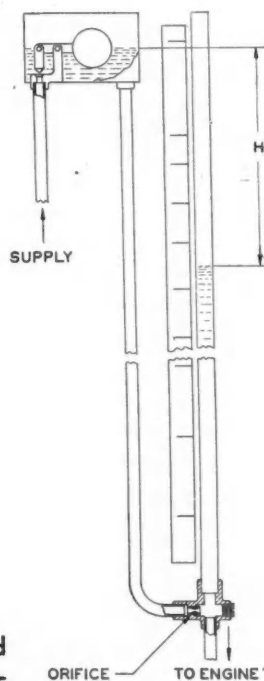


Fig. 5—Constant-head flowmeter + + +

cooled" dynamometer room. A 250-hp. dynamometer is driven through a tubular shaft passing through the fan outlet. Additional capacity, when needed, will be provided by the addition of a water brake to the dynamometer frame. The fan is driven by a 163-hp. electric motor at 1100 r.p.m. and produces a maximum blast velocity of 95-100 m.p.h. at the outlet. Cooling air is drawn in through the monitor roof and ejected through the doors at the end of the room, as in the propeller test rooms. While the cheapest to install,

this arrangement has the disadvantage of keeping the test room at outside temperature. Packard uses a suction fan which draws air over the engine through the hood at the rear, the air entering the test room being heated by coils as desired. The dynamometer may then be placed close to the engine, making a long shaft unnecessary.

With this type of set-up the control station may be either at the dynamometer (and hence somewhat remote from the engine), or it may be close to the engine, in which case the dynamometer load is transferred to the scale beam through a system of overhead levers. The latter arrangement was adopted, as it allows the engine to be closely observed during tests and minimizes the chances of damage to expensive equipment through engine failure. The lever system is shown in Fig. 4. To prevent air currents in the room from affecting the readings, it was necessary to box the load-transfer lever. The scale used is a Weight-O-Graph, which projects a continuous indication of the load on a ground-glass screen. A rather elaborate system of dashpots is needed to damp out vibration and make the figures readable at high engine speeds, but the operation of the system has been generally satisfactory.

Fuels other than the standard laboratory supply of domestic aviation gasoline are purchased in drums and circulated by an electric pump through a gravity tank with return overflow to the drum.

To provide facilities for water-cooled-engine research, two of the original eight propeller test rooms were combined and a 300-hp. dynamometer placed between the two test blocks, making a double-ended installation. The instruments are placed close together on the desk, the tachometer and revolution counter above the thermometers and pressure gages. The arrangement of the dynamometer control panel at 45 deg. with the engine center line brings the

controls conveniently close to the scale, yet allows access to the engine without walking around the panel.

Several different methods of fuel measurement are used. In the air-cooled dynamometer room the fuel is measured by the well-known system of timing the drop in level between two points in a cylindrical tank, the fall in level being observed in a gage glass and accelerated past the index points by restrictions in the tanks. Two tanks are used in tandem, connected at the top, and discharging through a four-way cock arranged so that when one tank is emptying, the other is being filled under pressure. Since the tanks are not vented, the system is kept under the constant supply pressure while measuring the fuel. A commercial flow-

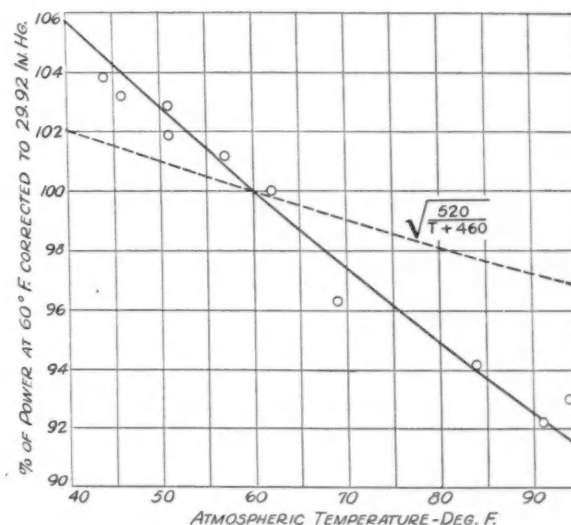


Fig. 8—Power vs. atmospheric temperature + + + +

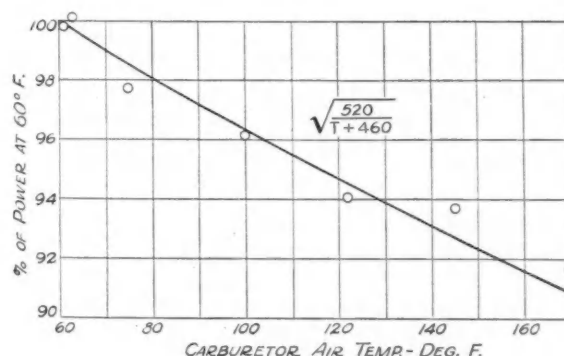


Fig. 7—Power vs. carburetor-air temperature (engine A70; barometer, 29.32 in. of mercury; blast temperature, 60 deg.) + + + +

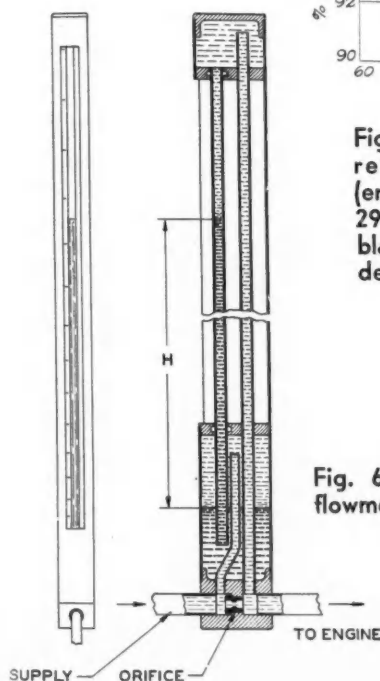


Fig. 6—Differential-head flowmeter + + +

meter of the tapered-tube type is used for carburetor setting.

For use on the test stands the constant-head-orifice type of flowmeter, shown in Fig. 5, was developed. These flowmeters are mounted in pairs, one supplying each stand. The orifice is a standard carburetor jet. The range can be readily changed by substituting another size of jet with its corresponding scale. The flow-

meters are calibrated in gallons per hour, and since the volume flowing, Q , varies as the square root of the head H , the calibration is not affected by the temperature or the specific gravity of the fuel. Fig. 6 shows a fully inclosed flowmeter being developed for light work. The differential head between a column of glycerine and a column of fuel indicates the rate of fuel flow. If Q is the volumetric flow; S_i , the specific gravity of the indicating liquid; S_g , the specific gravity of the gasoline; H_g , the pressure drop across the orifice in terms of gasoline head, and H , the differential head (reading of instrument), then

$$Q \text{ varies as } \sqrt{H_g} \dots \dots \dots (1)$$

$$H_g = H \left(\frac{S_i - S_g}{S_g} \right) \dots \dots \dots (2)$$

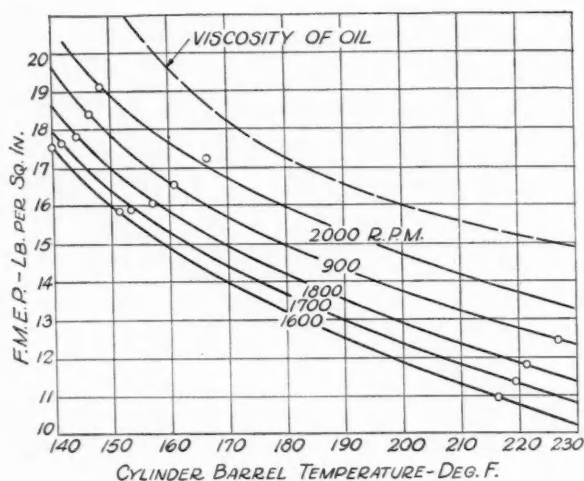
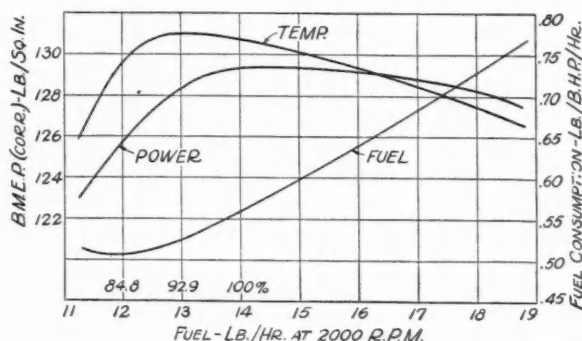


Fig. 9—Friction vs. cylinder-barrel temperature (engine A70) +

Fig. 10—Power and cylinder-head temperature vs. mixture strength + + +



Substituting in (1)

$$Q \text{ varies as } \sqrt{H \left(\frac{S_e - S_g}{S_g} \right)} \dots \dots (3)$$

from which it may be seen that the correction of the indication is affected by the specific gravity of the fuel used. The indicating liquid has a specific gravity of 1.143. From equation (3) it is found that if the specific gravity of the fuel varied from 0.715 to 0.730, an error of 2.5 per cent would be introduced. For accurate work, therefore, it is necessary to correct for fuels of gravity other than that for which the instrument is calibrated. The lower chamber contains the indicating liquid, while the upper chamber acts as a trap to prevent loss of liquid into the fuel line, should it all be forced into the upper chamber by excessive fuel flow. Both of these instruments were developed by C. F. Bachle of the laboratory staff.

Testing Methods

Correction for variations of atmospheric pressure is made by observing the dry air pressure at the engine during the test and correcting the observed power by multiplying it by the ratio this bears to 29.524 in. of mercury, this being the power which may be expected at standard barometric pressure and 10 mm. of water vapor in the air. Fig. 7 shows that for variations in carburetor-air temperatures alone the inverse square root correction is satisfactory, the cooling-air temperature in this case having been kept constant at 60 deg. Fahr. When the temperatures of the cooling air and the carburetor air were both varied the curve, Fig. 8, was obtained, measurements being made on the same engine, with corrections made for changes in barometric pressure. The data were obtained over a period of months, and while they indicate that the present

correction factor is inadequate, they are not suitable for the formulation of a new correction factor.

In air-cooled engines the piston friction loss varies rapidly with the temperature of the cylinder barrel, and Fig. 9 shows the variation of this loss in the A70 engine with barrel temperature. A drop in cylinder temperature from 240 to 180 deg. Fahr. results in a drop in m.e.p. of 3.2 lb. p. sq. in. and a drop in output of 4.4 hp. at 2000 r.p.m. This sensitiveness to temperature change does not mean that the friction loss of the air-cooled engine is necessarily high, as the mechanical efficiency at 240 deg. barrel temperature (the normal value) is 90 per cent.

In developing manifolding for optimum distribution, cylinder-head temperatures are plotted against mixture strength over a wide range. Fig. 10 shows the variation in specific consumption, power and head temperature of the A70 cylinder, with change in fuel flow. These results were obtained on a single-cylinder test engine is a 65-m.p.h. blast. It is seen that the maximum-temperature fuel flow is about 93 per cent of the maximum-power fuel flow, while the flow for minimum specific consumption is 85 per cent of the maximum-power flow. With perfect distribution the temperature curves of the individual cylinders would all peak at

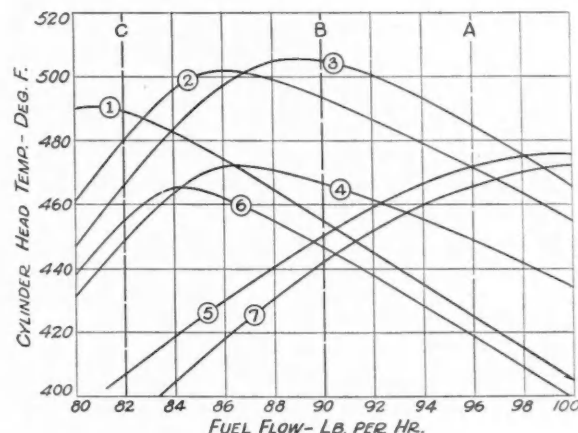


Fig. 11—Cylinder-head temperatures of individual cylinders vs. mixture strength + + + + +

the same fuel flow, but instead of this we may get, on first trial, a set of curves like those shown in Fig. 11. From this chart it is seen that cylinders 5 and 7 are receiving mixtures that are on the lean side of maximum temperature, while the mixture of 1 is too rich. Having located the "guilty" cylinders, Nos. 1, 5 and 7, we now start a series of manifold changes. Only three readings need be taken for each manifold change, at fuel flows A, B and C. If, when changing from A to B the temperature of 5 and 7 rises, instead of falling, the lean condition has been corrected. If, in going from B to C the temperature of 1 does not rise, it, too, has been brought into line.

A continuous run is considerably harder on the engine than an interrupted run at the same speed, even though no adjustments are made during the (Turn to page 746, please)

Weight-Efficiency of Batteries Has Increased 200 Per Cent Since 1912

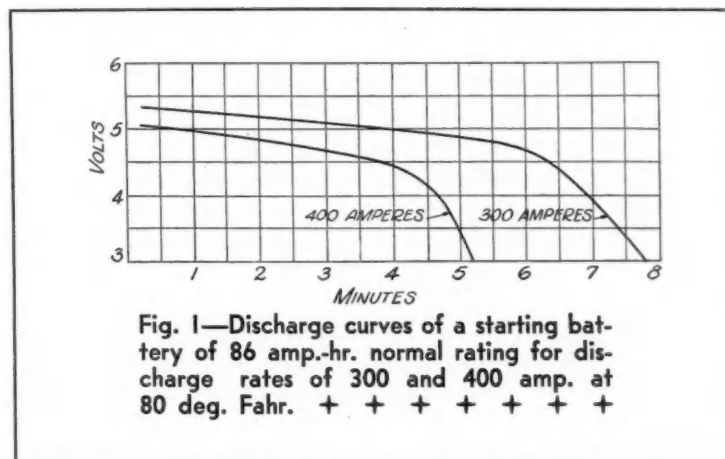
Recent developments in starting battery design have been toward minimizing the effects of low temperatures on voltage and capacity under a high rate of discharge

IN a paper on "Starting Battery Performance," recently read before the Philadelphia Section of the S.A.E. and later before the Canadian Section at Toronto*, the author, L. E. Lighton of The Electric Storage Battery Co., drew a parallel between the first batteries used for starting purposes on the Cadillac 1912 model and present batteries for the same purpose. The 1912 battery had 12 small cells, each consisting of three plates in a small hard rubber jar with a soft rubber cover. No sealing compound was used. These cells, assembled in four groups of three each, were placed in a wooden case, and were connected in series for starting at 24 volts, and in parallel for lighting and ignition, at 6 volts. This battery, weighing about 67 lb., had been used during previous years in connection with other devices requiring high rates of discharge. Experience in these fields indicated that this type of battery was best adapted to meet the high rate starting requirements of the automobile, as understood at that time.

The battery used for automobile starting purposes is no more the story of the storage battery industry than is the automobile the story of transportation. Increasing requirements during the past 20 years in all fields for battery performance providing high rate discharge ability have brought about many refinements in processes and construction which have made the batteries better adapted for use with all these devices. In portable battery service particularly, there has been a demand for a decrease in weight. Starting batteries fall in this class, and as an example, Mr. Lighton stated that if the Cadillac V-16 were to be started at low tem-

peratures by means of a battery of the same general design, the parts of at least three of the 1912 batteries would have to be used, which would bring the weight up to over 200 lb. Actually the V-16 has a starting battery weighing 72 lb., or only 5 lb. more than the 1912 unit. Although the same chemical elements are still used, changes in the composition of the materials, in methods of processing and in assembly have made possible this great increase in weight efficiency.

At the present time batteries are usually selected on the basis of the current requirements of the starting motor, for in the case of the passenger car, truck or tractor, a battery that has sufficient capacity to meet cranking requirements has more than sufficient capacity for all other purposes. This, however, does not hold in the case of motor coaches and power boats, where the lighting load is so great that a battery of sufficient capacity to meet its requirements is easily sufficient for starting. In recent years the current requirements on passenger cars for other purposes than engine starting have constantly increased, and the electric accessory load of the passenger car is now assuming the proportions of the lighting load of some of



the earlier buses. A little more each year.

In starting an internal combustion engine the battery is required to furnish a momentary "breakaway" current of from 200 to 600 amp., and then a cranking current of from 150 to 400 amp. for some seconds more. The terminal voltage during discharge is an important factor, as it determines starting motor speed. The voltage at the initial high rate of discharge is difficult to measure with accuracy, and for this reason the voltage at the end of 5-sec. discharge is obtained and is widely used for comparing starting

* March 18.

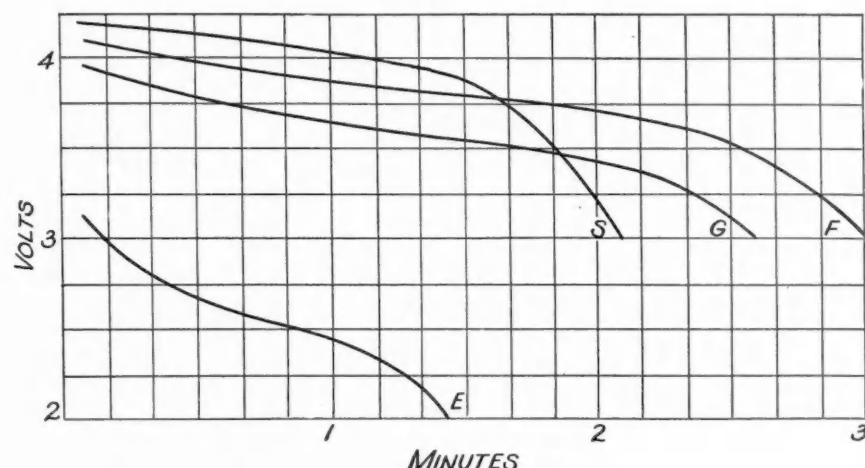
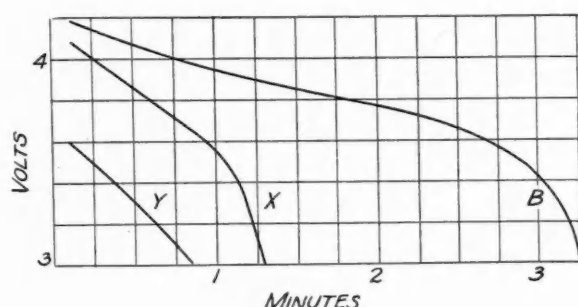


Fig. 2—Discharge curves of four batteries of the same general size and the same capacities at normal rates of discharge, for a discharge rate of 300 amp. at zero Fahr. + + + +

Fig. 3—Discharge curves of three similar sized batteries, representing different periods in battery development, at 300 amp. at zero Fahr. + + +



battery performances, 5 sec. being an average starting time.

Fig. 1 herewith shows the behavior of a battery at discharge rates of 300 and 400 amp. respectively, with respect to terminal voltage and time. A larger battery, of course, will give a correspondingly larger current at the same voltage and for the same length of time, while for the same rate of discharge the voltage will be higher and the discharge will be continued longer. High-rate test dischargers are usually stopped at either 3 or 2.8 volts, these being the minimum voltages at which satisfactory ignition can be obtained.

Plate design and general assembly have little effect on low-rate performance at normal temperatures, but they have an important effect on the high-rate performance, particularly at low temperatures. In a general way the amp.-hr. capacity at a low rate of discharge is a measure of the amount of active material in the battery, but in cranking the engine high rate of discharge is required, and by varying the design the proportion of the active material available for high-rate discharge can be varied. This is illustrated by Fig. 2, which shows high-rate discharge curves for four different types of batteries used for starting purposes, all of the same make, and of the same rating (86 amp.-hr. on a 20-hr. discharge basis) at normal temperature. The curves shown were obtained when

discharging at 300 amp. at zero deg. Fahr., which rate and temperature are being considered by the Electrical Division of the S.A.E. Standards Committee as a standard for comparison of low-temperature starting ability of batteries. Battery S is a high-rate discharge battery, used very largely on airplanes; batteries F and G are popular automobile and power boat starting batteries, while battery E meets the requirements of motor coach or emergency lighting service where low-rate capacity is the principal requirement.

The temperature of the electrolyte greatly affects the 5-sec. voltage and capacity. A battery which will deliver 300 amp. at 5.3 volts at 80 deg. Fahr. will deliver that current at about 4.60 volts at 10 deg. and at 4.40 volts at zero, with corresponding reductions in the high-rate capacity. Recent developments in the design of batteries used for starting internal combustion engines have been along the line of minimizing the effects of low temperatures on battery voltage and capacity under conditions of high-rate discharge. Curves B, X and Y in Fig. 3 show the battery voltages in relation to time under a discharge of 300 amp., for three batteries of the same make, the same size and having the same capacity at a low discharge rate. The plates do not differ in size and design, and the differences between the curves reflect refinements in design, process and manufacture. Curve Y is from a battery made in 1914; curve X from a 1921 battery, and curve B from a 1931 model. These curves, all corresponding to a discharge rate of 300 amp. at zero deg. Fahr. show 5-sec. voltage values of 3.6, 4.1 and 4.2, and an increase of 390 per cent in the cranking time for the 1931, as compared with the 1914 model. While strides have thus been made in battery design in the past, new problems have recently been encountered through a considerable increase in the electrical load on passenger car electric plants. Higher driving speeds require better road illumination, and as a result we have today the new 32 cp. head-

(Turn to page 737, please)

Industry's Leaders Protest to Hoover; Cite Foreign Bars to U. S. Vehicles

AROUSED by the practice undertaken by some of the smaller countries of indirect tariff discriminations against American motor vehicles, a delegation of prominent American motor manufacturers conferred for about 45 minutes with President Hoover on Tuesday and made strong representations against continuance of these methods. On Monday similar conversations were held with Secretary of State Stimson and Secretary Lamont of the Department of Commerce. The presentations were made on behalf of the board of directors of the National Automobile Chamber of Commerce by Roy D. Chapin, chairman of the board and of the Hudson Motor Car Co. The motor executives expressed apprehension that if continued, the practice by the smaller countries might lead to a general breakdown and adversely affect foreign trade.

"The administration officials have shown a fine co-operative spirit, and we deeply appreciate it," Mr. Chapin told *Automotive Industries*. He said he was not at liberty to say more about the attitude of the President and his two cabinet officials.

Commenting on the situation complained of, Mr. Chapin, in a prepared statement, said:

"During the past four years several nations have resorted to practices which have discriminated directly against American cars in favor of vehicles manufactured elsewhere.

Indirect Taxes Many

"Quota systems have been imposed under which dealers in American cars have been seriously hampered. Elsewhere, internal taxes have been levied which work hardships on the types of cars which we make in this country. Engineering terms such as compression ratio, piston displacement and similar devices have been employed in general language but with the specific effect of denying us a fair competition.

"While this practice has not been indulged in our larger markets, the precedent is a bad one and one which our foreign competitors would like to see adopted elsewhere.

"Under our foreign policy, we accord the same treatment to all and our whole series of commercial treaties has been built upon the principle of securing equal treatment from other nations. The resort to subterfuge is a denial of that fair play upon which international trade must rest and we feel that it should be strongly resisted."

1,000,000 Cars Delivered in Export

During the course of his discussion, Mr. Chapin noted that in 1929, the banner year of American export trade, 1,000,000 motor vehicles of American design were delivered to the 100 countries of the world, a

trade which was equal to the total sales for the year in 28 states of the Union.

"Not alone did this provide weeks of employment for the 4,000,000 of our people, who derive their livelihood from the motor industry," said Mr. Chapin, "but other countries of the world profited as there are many commodities in the motor car which cannot be produced here and consequently are bought in world markets.

"Every state in the Union furnishes articles used in car manufacture and hence they all have an interest in the maintenance of motor export trade," he said.

Great Development Ahead

The future market, Mr. Chapin looked upon as one which would insure profitable employment for millions for years to come.

"It is only necessary to remember," he said, "that while we have but 8 per cent of the world's population, we now have 76 per cent of the motor vehicles.

"Every nation wants motor transportation. The whole development of large areas depend upon, it and world use of motor vehicles should rapidly increase.

"Aside from any consideration of the effects upon our business, as a purely selfish national matter, the speed of our export development must rest upon our ability to furnish the vehicle at a low cost.

"Through research and the highest development of efficiency within our factories, and outside them, we have done everything we can to bring about the very lowest cost of the car and its upkeep.

"But there are some things which only government can do and one of them is a reduction in the artificial costs imposed by indirect discriminations in certain countries.

"Excessive charges deny governments the revenue which the car brings them throughout its use, and restrict the ability of their citizens to use these new tools of progress, through the penalties which add to the cost and so limit ability to buy.

No Advantages Asked

"The motor manufacturers of America do not ask for any advantage. They are ready to undertake any legitimate effort to promote the use of the vehicle. Field representatives of the National Automobile Chamber of Commerce have already toured 55 countries of the world lecturing upon the use of the vehicle and doing all they can to assist in sound promotion.

"They stand ready to meet the task of expansion which is one of the sure developments ahead, but as a matter of self-interest on the part of the countries involved, they feel that competition should not be permitted to make its way by unfair advantages of discrimination."

JUST AMONG OURSELVES

by Norman G. Shidle

WE KNOW a big car company sales executive—we'll call him Simmons because that isn't his name—who spends a large share of his time on the road contacting his dealer organization and everlastingly emphasizing to them the fact that success depends on the individual personal application of sound management in their own businesses.

Dealer Must be Active in His Business

The dealer himself must actively participate in the management and operation of his business every hour or every day, if success is to be achieved, this executive preaches. He has no faith in schemes, movements, trick ideas nor generalized plans—used car or otherwise—as effective means of bringing about dealer success.

"Don't you sometimes get a bit discouraged," we heard Parker, a fellow executive, ask him the other day, "about the difficulty of getting individual dealers to apply this doctrine of yours?"

"You are doubtless right," this questioner continued, "in your contention, but, it seems to me, that you assume as an axiom the idea that every retailer definitely wants to make money and is willing to make the personal emotional sacrifices necessary to get it. And my contacts with dealers indicate just the opposite."

"No, I don't get discouraged," came the reply, "because I started out perfectly aware that progress would be slow. But we have made progress in our own organization along these lines in the last decade—enough so that I'm certain we're on the right track."

"Well, maybe you are right, but it's hard for me to believe it," Parker declared. "All dealers want to make money, to be sure. But they also want a lot of other things as human beings. They want to be executives, if they possibly can afford to do so. They want to avoid personal, emotionally unpleasant customer contacts if they can rationalize themselves into some excuse for avoiding them. They want to get their minds off their businesses on week-ends and sometimes during the week. They want other similar things—and frequently they want some of these things worse than they want money."

Few Admit They Want More Than Business

"Few of them admit this even to themselves; but their actions prove it clearly in a majority of cases."

"Yes, but even granting that," Simmons retorted, "there's no use laying emphasis on interior decoration when solid foundations are needed to keep a building stable. And there just isn't any possible substitute for the taking of personal management

responsibilities by the man who is managing a dealership.

"The men who can't or won't do this, just can't be successful as automobile dealers. It's as simple as that. Men of the kind that you talk about inevitably will go broke trying to operate automobile dealerships. It isn't a matter of whether I think they should or not. They just do."

"Maybe so," Parker mused, "but I can't help feeling that it's human nature to dodge responsibility and that this human trait has to be taken into consideration in dealer education work. You will have to admit that few men have the determination, the everlasting power to drive themselves, the quality of self-analysis, the ability to refrain from rationalizing, the strength to concentrate on an objective and fight toward it without cessation that is just second nature to you personally."

"Can you hope to get the average retailer to remake himself sufficiently to bring about application of these simple, fundamental ideas of sound management which you urge as the only means to permanent dealer success?"

Only Few Succeed Without Help

"Yes, I think we can. Of course, there are all stages of management between the active, intelligent kind that we preach and the utterly incompetent.

Wherein we hear two factory executives talk shop and discuss methods of applying dealers helps that help + +

Somewhere in between the two is a twilight zone that hovers between success and failure. Plenty of dealers are in that zone. I am perfectly convinced that we can build a majority of them along these sound lines to a sufficient extent to get them into the success zone.

"I will admit, on the other hand, that only a few endowed with peculiar natural qualities of enthusiasm, intelligence, determination and persistency will be able to achieve that full measure of success which accrues only to unusual talents in any line."

Tricks, Ideas and Schemes Take a "Rap"

"Seems to me, though, that there is a certain amount of merit in many of the 'schemes' and 'trick ideas' which you dislike so much," Parker interpolated. "While it's true that they aren't to be compared to good, personal management as success-makers, they do offer the average dealer some chances for success which otherwise he wouldn't have. They provide specific ideas which can be comprehended by many dealers who can't see the basic picture you are trying to paint—and thus stir them to action of some kind."

"They stir him to action of some kind—yes!" Simmons came forward in his chair with a jerk. "But they waste his energies, divert his thinking from useful

channels and put him down a few months later just a little behind where they picked him up. Chasing will-o'-the-wisps has never helped any dealer either to make money nor enjoy life."

Most Men Work to Get Rid of Work

"Just the same you've got to recognize the fact that few men enjoy work," Parker was beginning to get warmed up himself. "A good many pretend to enjoy it. But most men view work as a means to no-work. That being the case, isn't it necessary to take dealers as they are and try to develop some means of getting on at least reasonably well under those circumstances?"

Simmons reflected for a moment. Then—"Certainly we have to take them as they are; but the moment you admit that they can't be changed you admit yourself to be a failure in your job of helping them to more profits."

"Taking them as they are doesn't mean dazzling them with fancy and perhaps popular ideas just for the sake of getting them to move in any old direction. Taking them as they are means emphasizing and reiterating sound, common-sense ideas about ordinary good business methods and helping them practically in every way possible to put those methods into effect in their own establishments."

"Well, granting your thesis for

a moment," Parker conceded, "won't you admit that in presenting and reiterating these ideas to the average dealer, it is desirable to simplify them as much as possible and to dramatize them a good bit more than usually is done. A prospect file is a useful but fairly uninteresting thing, you know, when you talk about it as a prospect file. But call it a 'Treasure Chest' and you've got something to romance about as well as to use in a practical way."

"Now we're beginning to get somewhere," Simmons rejoined. "I do agree that we haven't gone nearly far enough in dramatizing and presenting these business fundamentals in terms which will be interesting as well as useful to the average dealer mind."

Dramatizing the Business Fundamentals

"Probably the best thing that can be done is to break down these sound methods into their simplest and most specific details; then look constantly for new ways to re-dramatize as well as reiterate those details."

"I'll certainly agree with that," came Parker's hearty approval. "And I'll add that this goes for parts and accessory as well as motor vehicle merchandising work among wholesalers and retailers. More than one successful company has already proved it, for that matter."

Autogiro Attachments Now Available Units for Ships Up to 4000 lb.

New setup relieves the licensee of the complexities of design and manufacture of special attachments so that he can concentrate upon aerodynamic problems + + +

by Joseph S. Pecker

Chief Engineer, The Autogiro Specialties Co.

WHEN the first American Autogiro was built, its designers were confronted not only with aerodynamic problems, but also with the design and manufacture of the essential attachments. And, as it later developed, the latter presented a problem of no small proportions. With the development of a definite policy concerning Autogiro manufacture in this country, a new setup has been created which should prove of interest to prospective licensees and those concerned with aircraft generally.

The first step in a progressive program was the formation of the Autogiro Co. of America, whose function is to license prospective aircraft manufacturers. The final phase, and the one with which we are concerned here, is the recent entry of the Autogiro Specialties Co., Philadelphia, Pa., as a parts manufacturer specifically for the purpose of making Autogiro accessories. This company will supply licensees with standardized units suitable for ships up to 4000 lb. gross weight. For the present the requirements of heavier ships will have to be handled in a special way.

The new setup therefore represents an important step forward because the prospective licensee need no longer be concerned with the complexities of design and manufacture of special attachments, but can concentrate all his effort upon the aerodynamic problems with

which he is confronted. Moreover, in the manufacturing plant, the licensee

is relieved of the burden of making new patterns, expensive tooling, and probably the installation of additional equipment.

Briefly, the Autogiro attachment consists of the following units:

1. Complete rotor system.
2. Mechanical starter.
3. Brake for the rotor blades.

The present design for which this company has tooled up and which is now in active production is the product of a long process of evolution and reflects the current principles of design as well as field research. Although the essential features of design are discussed later, it is well to note at this point some of the factors contributing to the present stage of the art. First is an involved mathematical theory which had to be tested against actual field research. Added to this were the following factors of fundamental design: 1. Establishment of factors of safety to meet the requirements of safe flight. 2. Reduced parasite resistance. 3. Low weight in order to lower the center of gravity.

One of the objectives of the Autogiro Specialties Co. is to follow field work continually and thus build up a record of performance to serve as the basis for future design changes or refinements. Whenever such refinements are put into effect.

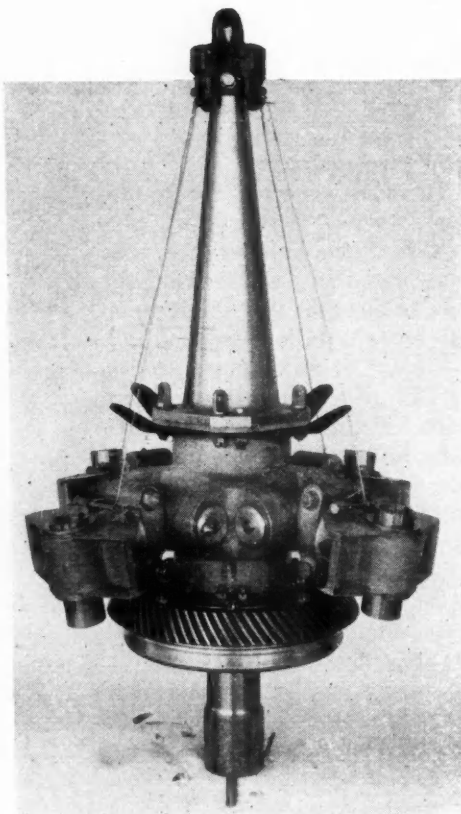


Fig. 1—Autogiro rotor system composed of the hub, articulation joints, driving gear and pylon. Rotor blades are not shown + + +

as Standardized

the information will be made available to all licensees and will be incorporated in the current production of parts. This will place everyone on an equal footing and will give the individual manufacturer the benefit of the experience of all Autogiro licensees.

Another advantage, as we see it, is the establishment of a uniform selling price on these attachments, thus permitting every licensee, regardless of quantity requirements, to compete on an equal basis. Finally, as a corollary to standardization, there is the possibility of manufacturing at the lowest possible cost. And increasing quantities due to the

pooling of requirements of a number of licensees should result in still lower levels of cost.

The rotor system, shown in part in Fig. 1, consists of the following main units:

1. Rotor hub containing the radial and thrust bearings on which the entire system rotates.

2. A set of four universal joints of special construction. These joints permit free articulation of the rotor blade in both vertical and horizontal planes. In addition, the universal joints provide a flexible adjustment for incidence of each blade; after the adjustment has been made it is locked rigidly against torsional rotation when in flight.

3. A cone member fastened to the top flange of the hub which carries the diagonal cables employed to suspend the blade in a horizontal position.

The gross weight of the complete rotor system is approximately 350 lb., including four blades.

The hub, Fig. 2, is a massive forging of an oil-hardened, chrome-nickel alloy. In forging, special care is taken to have the grain structure approximate the direction of the loads that are imposed through the lugs, ball bearings and flanges. In manufacture the forgings are normalized, quenched, drawn, and rough-machined. Then heat treated, drawn to the proper degree, carefully tested, and finish-machined. After machining, all tool marks, scratches, etc., are polished clean and exposed surfaces cadmium plated.

The hub houses three ball bearings on the vertical axis. Thrust in flight is taken by the top bearing, the second carries only radial loads, while the third



The organization of a company to supply Autogiro units to licensees should bring this type of ship closer to public notice

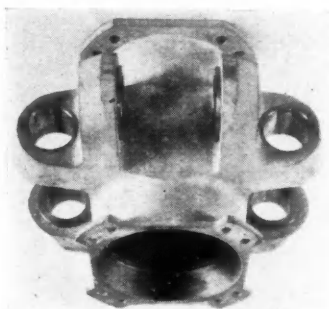


Fig. 2—The rotor hub is a massive forging of an oil-hardening, chrome-nickel alloy + +

takes radial loads in flight and combined radial and thrust loads of the rotor system when revolving on the ground. Some idea of these loads may be gained from the fact that the torque developed on the lugs from starting of the rotor blades from rest is about 2000 ft. lb. Moreover, the centrifugal force developed at each universal joint amounts to approximately 13,000 lb. when the hub revolves at maximum speed. This is for a ship weighing 3000 lb.

One of the most important problems concerned in the development of articulation joints was the proper selection of bronze and lubrication. Some idea of the magnitude of the job may be gained from the fact that the bushing has to withstand a pressure of about 7000 lb. per sq. in., due to combined centrifugal and torsional loads developed by the blades. The problem was solved by the development of a special bronze bushing provided with a grease groove and lubricated with grease. In tests run to destruction, these bearings were found to function without sizing or scoring for hundreds of hours with a minimum charge of grease.

The mechanical starter is distinctly an American development and marks a fundamental advance in the Autogiro principle. With the starter, the rotor

blades can be set immediately in motion and the ship can be made to ascend at a steep angle without any necessity for taxiing. The current design shown diagrammatically in Fig. 3 consists of the following three main units:

1. The lower unit, mounted on the rear face of the engine, comprising a set of spiral gears and a single-disk clutch. It provides the gear reduction from engine crankshaft speed to the rotor-blade speed of 125 r.p.m.

2. A tubular torque shaft which transmits power to the system.

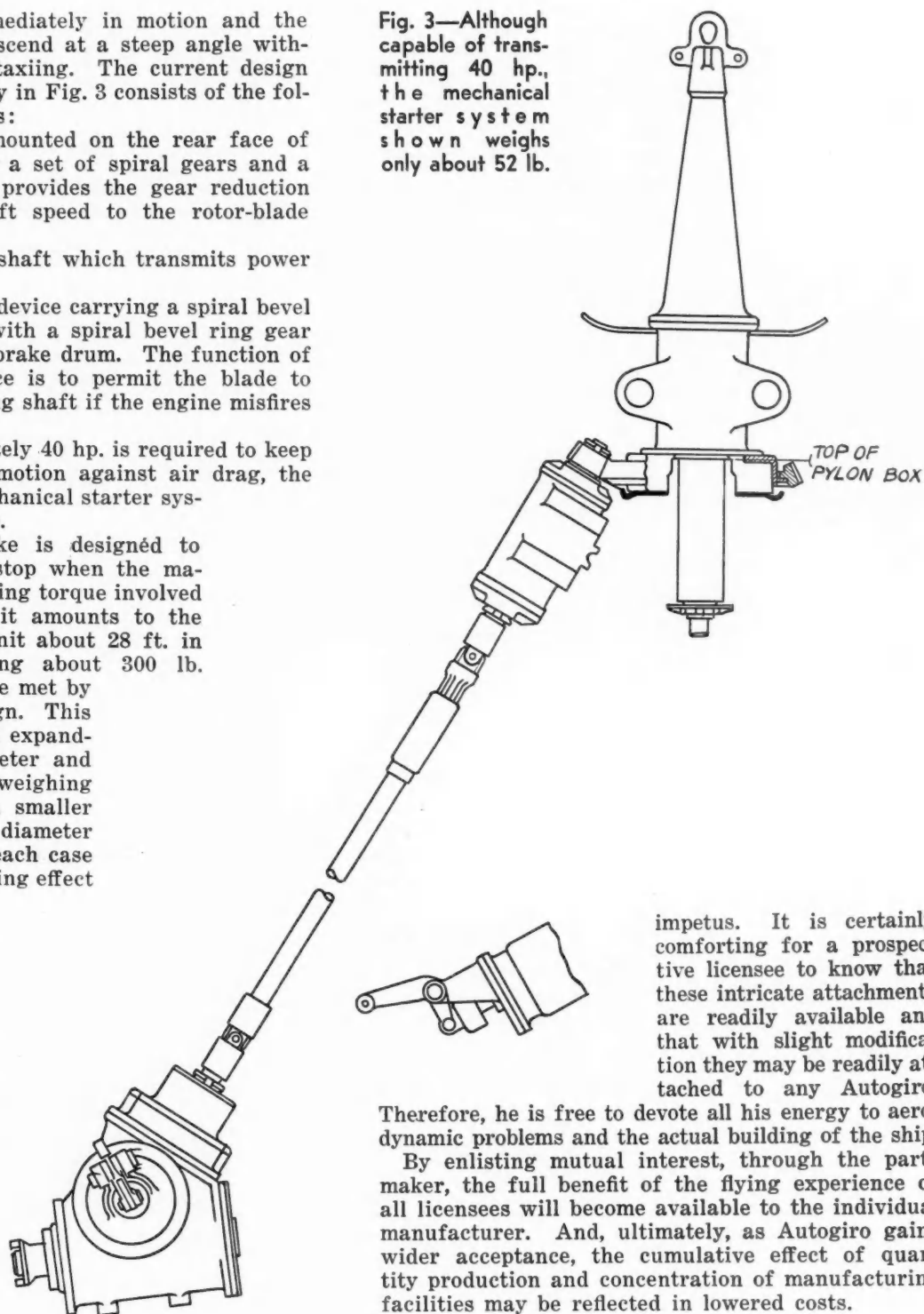
3. The over-running device carrying a spiral bevel pinion which meshes with a spiral bevel ring gear mounted on the rotor brake drum. The function of the over-running device is to permit the blade to run ahead of the driving shaft if the engine misfires or is slowed up.

Although approximately 40 hp. is required to keep four 75-lb. blades in motion against air drag, the total weight of the mechanical starter system is only about 52 lb.

The rotor hub brake is designed to bring the rotor to a stop when the machine lands. The braking torque involved is considerable since it amounts to the flywheel effect of a unit about 28 ft. in diameter and weighing about 300 lb. These requirements are met by the present brake design. This is a two-shoe, internal expanding brake, 8 in. diameter and 1½ in. face, for a ship weighing about 4000 lb.; for a smaller ship the brake is 6 in. diameter and 1¼ in. face. In each case there is sufficient braking effect to stop the rotor blades revolving at 125 r.p.m. within 30 sec. One lever in the cockpit operates both the starter and the brake.

This brief outline gives some of the essential details of Autogiro attachments, together with a few of the design factors involved. Unquestionably this new setup is destined to provide Autogiro development with a new

Fig. 3—Although capable of transmitting 40 hp., the mechanical starter system shown weighs only about 52 lb.



impetus. It is certainly comforting for a prospective licensee to know that these intricate attachments are readily available and that with slight modification they may be readily attached to any Autogiro.

Therefore, he is free to devote all his energy to aerodynamic problems and the actual building of the ship.

By enlisting mutual interest, through the parts maker, the full benefit of the flying experience of all licensees will become available to the individual manufacturer. And, ultimately, as Autogiro gains wider acceptance, the cumulative effect of quantity production and concentration of manufacturing facilities may be reflected in lowered costs.

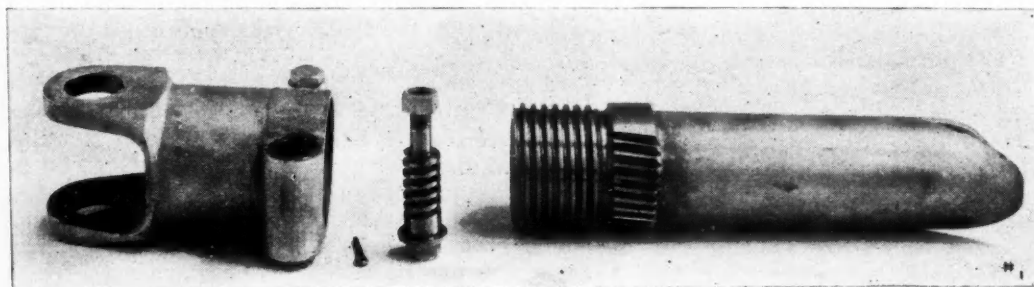


Fig. 4—Spar end assembly taken apart to show method of changing angle of incidents of the rotor blade. The yoke engages the vertical articulation pin

PRODUCTION LINES



Are You a 100 Per Center?

ONE point C. E. Knoeppel (industrial counsel) made the other night fairly screams for attention. He was discussing his hobby "profit engineering" before a joint meeting of the N.A.C.A. and S.I.E. Practically everybody has a replacement program for modernizing shop equipment. The money comes from a depreciation fund, or sinking fund, or what have you—but what have you? He advocates a strong depreciation reserve absolutely unavailable for any other purpose. And the proper way to accumulate the fund is to make the product pay for it. Tack it on as a definite overhead burden.

Frapped Profits

PROFITS, according to Knoeppel, take an awful beating from fixed charges. So-called "fixed charges" raise the break-even point between income and expense too high. In some cases the real profit doesn't show until the plant is at about 100 per cent capacity. A great many of the larger manufacturers in the automotive field have recognized this. Elimination-of-waste campaigns, factory budgets and control of non-production materials are direct results. Some of the best of these have been described in *Automotive Industries* recently. There is gold in these control systems.

Automotive Industries

Whither Micromotion?

MICROMOTION study is the latest wrinkle. The widest use so far has been the analysis of assembly operations. No one yet can predict its possibilities or limitations. But the other day we saw some gadgets that may break the field right open. Maybe the most important of these is a small, compact camera with a built-in timing device, patented), which may be announced soon.

K = 1.97 Or . . . ?

THE American Leather Belting Association has just published a book of interest to everyone concerned with transmission problems.

PRODUCTION MEN—

this page is yours.

Its purpose is to discuss your problems, to air opinions and developments which are primarily of interest to you.

Won't you pass on your ideas to other men in the industry through this page?

Thank you.

"Treatise on Leather Belting" was written by George B. Haven and George W. Swett, both professors of machine design at M.I.T. It's a thoroughly technical treatment of belting problems. Contains many accepted formulas as well as some new material. An appendix contains 25 tables of value in calculating belt drives. 249 pages. Price \$1.50.

Commenting on the leather belting situation, W. F. Schaphorst, well-known technical writer, asks why belt users aren't made more familiar with the high grade special mineral tanned belting. Insisting that a high coefficient of friction is necessary for modern drives,

he rates special mineral tanned leather belting a coefficient of friction of 1.97. Quoting from tests made by the French government.

Training Foremen Pays

MORE and more it is realized that the foreman is the key man in the modern shop. And many forward-looking managements are taking steps to fit him for the job. One of the best ways is the conference method under competent trained leaders. E. L. Keller of Pennsylvania State College tells us that in the period 1922 to 1930 they handled 176 groups of foremen for 98 different companies in Pennsylvania. These figures do not include more than one group per year. Take in practically every industry you can name.

Obsolescence—When?

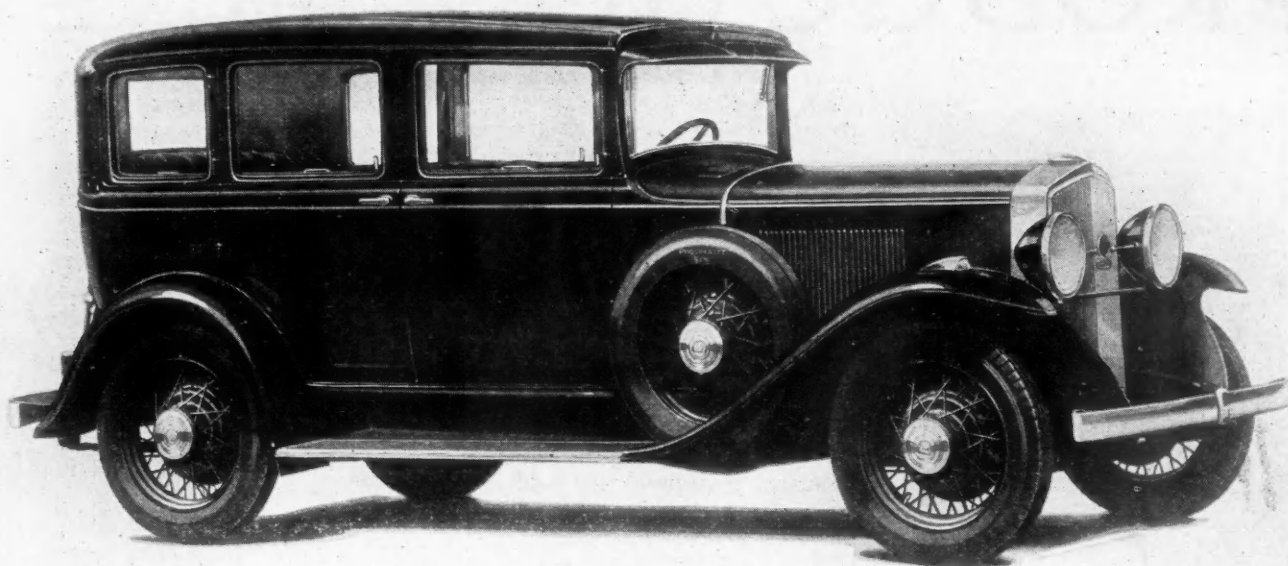
OBsolescence—ever prove just when and why some equipment should be replaced? One of the big universities in the East promises to do some tall thinking on this job. Hope eventually to get it down to some simple rules that anybody can juggle around and get the answer. More power to them.

Materials Handling

WHAT do you do with tough and tricky materials handling jobs?—some say industrial trucks. Surprising how useful they can be in an automotive plant. The last word is shipping on skids—off the assembly line, into the freight car, over to the assembly line to the other end. Several parts makers are doing it already. Saves handling and packing, prevents breakage. Facts and figures, given by R. L. Lockwood, in "The Development of Skid Shipping," read at the National Materials Handling Meeting, Cleveland, last week.—J. G.

MANUFACTURING
MANAGEMENT
METALLURGY

May 9, 1931



The "Prosperity 6" is a derivative of the Standard 6 and is delivered with 19-in. artillery wheels as standard equipment and carries 5.00-in. balloon tires + + + +

Graham-Paige "Prosperity 6" Bids For Sales in Lower-Priced Group

WITH the introduction of the "Prosperity Six," Graham-Paige Motors Corp. announces its entry into active competition in the low-priced six-cylinder field. The car itself is a derivative of the present Graham Standard Six, with a slightly smaller engine and 2-in. shorter wheelbase, and is priced from \$785 to \$825.

There is nothing radical as far as design is concerned in the Prosperity Six, or Graham 56, its technical model designation. In fact, transmission, clutch, universals, front axle, springs, and rear axle, except for gear ratio, are identical with those of the Standard Six.

Similarly, in the bodies, the new six follows closely the lines of the larger Graham models. There is the characteristic curved radiator front with one-piece chrome-plate shell and vertical vanes. Headlamps, rims and tie-rods are also chrome-plated and carry the Graham monogram. New fender lights have been worked out, however, these being of the streamlined type, faired into the fender.

Among the body accouterments are to be noted con-

cealed hood-latches, exterior sun-visor, a rear end gas tank cover with two chrome-plated beads for decoration and two cowl ventilators. Fenders are one-piece stampings, running boards are covered with linoleum and trimmed with metal binding at all edges. Rubber shields at the rear of the running boards protect the wheel finish.

Inside the cars are to be noted treadle-type accelerator pedals, three-spoke thin grip 18-in. steering wheels, engine thermometer on the dash, also a fuel gage, and brake and clutch pedals adjustable to suit the individual driver. Front cross seats are adjusted as to the fore and aft position by means of the hold-down bolts. Rear seat cushions are also adjustable. Fender wells and trunk rack are included in the special equipment at extra cost.

All body panels are coated with insulating compound to deaden sound.

Bore and stroke are $3\frac{1}{8}$ by $4\frac{1}{2}$ in. for a piston displacement of 207 cu. in., as against 224 for the Standard Six. Horsepower developed is given as 70 at 3200 r.p.m. by the factory, while tax rating is 23.44 hp.

Prosperity "6" Prices

Business coupe	\$785
Rumble seat coupe	825
2-window 4-dr. sedan	795
3-window sedan	825

Prosperity Six Specifications

Unless noted here, major and service specifications are identical with those of the Graham Standard Six, which appeared in the February 28, 1931, issue of *Automotive Industries*

Wheelbase	113 in.	Total advance	18 deg.
Engine bore and stroke	3 1/8 x 4 1/2	Battery length	9 1/16
Piston displacement	207 cu. in.	Height	8 7/8
Taxable horsepower	23.44	Amp. hr.	84
Maximum horsepower	70 at 3200	Rear axle road clearance	8 1/2 in.
Std. compression ratio	5.45 to 1	Std. gear ratio	4.45 to 1
Vibration damper	none	Optional ratio	4.9 to 1
Engine mounting	4 point	Tire size	5.00/19
Type	rigid	Shackles type	rubber
Carburetor make	Schebler	Minimum turning radius	20 1/2 ft.
Cooling capacity	5 gal.	Rear tread	58 3/4
Distributor type	full automatic	Overall length of car	162 in.

Compression ratio is 5.45 to 1. The powerplant mounting differs somewhat from other Graham-Paige models, being of the four-point rigid type. Engine accessories also show points of difference. The distributor, for instance, is of the full automatic type, with a total of 18 deg. of advance.

A Schebler carburetor is provided on the new six, with a 1 1/4-in. throat diameter, and fitted with a vacuum-controlled economizer in addition to the usual accelerating pump, etc. Fuel feed is by a camshaft-driven pump as usual.

Clutch and transmission are of conventional design, the clutch, however, incorporating a spring-type damper, and the three-speed spur gear transmission, a clutch brake for rapidity of shifting. Final drive ratio in the semi-floating axle is optionally 4.45, or

4.9 to 1, the latter chosen of course for hilly country.

Brakes are internal hydraulics for service, and on the propeller shaft for emergency, both sets of brakes being of the same size as on the Standard Six. Steering gear is a Ross cam and lever with the column mounted on ball bearings, and a taper roller bearing for the king pin thrust.

Simplified chassis lubrication is obtained by the provision of rubber shackles. These are of the same type as used on other Graham cars, consisting of cups into which rubber is compressed by tightening the shackle side bars, so that it is firmly locked in place.

A feature that is worthy of note for a car in this price class is the provision of invar struts in the Bohnalite pistons. These struts are of the wide type, with a cut-out in the center for the piston pin boss.

Weight-Efficiency of Batteries Increased

(Continued from page 728)

lamps, which consume 40 per cent more current. The fan of the hot-water-type of car heater consumes 3 amp.; the hot-bar or infra-red ray sleet cleaner, 6-8 amp., and additional loads are being thrown on the generator and battery by the radio, special high-power spotlights, guiding lights for safety in turning corners, and numerous other electrical accessories.

The average car has been designed with a connected accessory load of 9 to 10 amp., yet it is not difficult today to find a car with a load of 20 amp., and some have been observed with as high as 28-amp. load. The generators on these cars generally are capable of a safe maximum output (when hot) of 12-16 amp., and with the excessive accessory loads it is difficult to keep the batteries charged, especially in winter time, when the accessory loads are on longest and there is little opportunity to restore the battery charge by prolonged daylight driving. One feature of quite a number of 1931 models, free-wheeling, has an effect on the charging capacity of the generator, for when the car is free-wheeling the charging rate is reduced

and the cut-out may even be open and the battery be discharging. Most cars having the free-wheeling feature therefore have been equipped with larger generators or with generators producing a larger output, and in some cases batteries of larger capacity have been supplied.

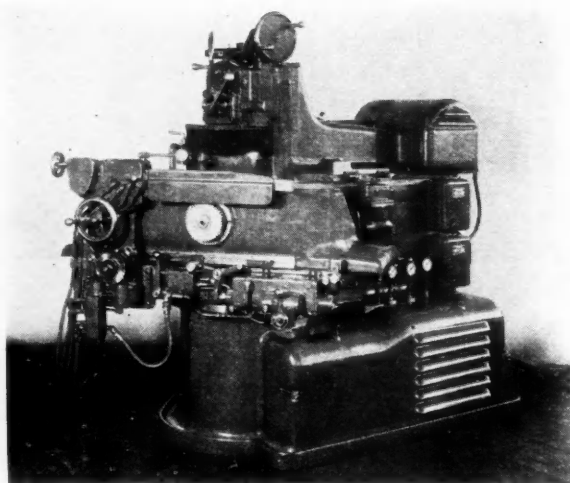
Mr. Lighton said that, contrary to popular belief, starting the engine is not hard on the battery, and properly designed battery plates are not damaged by high rates of discharge, but after a battery is discharged, whether at a high or low rate, it should be charged again promptly. The amount of electrical energy required for an average start is not large, and normally will be replaced by the generator in about three minutes of driving.

The speaker also dealt at some length with conditions of starting in cold weather and showed on the screen the action going on in an actual battery during charge and discharge, a small transparent battery being inserted in the lantern so that the evolution of gas, particularly at the positive plate, could be clearly seen.

NEW DEVELOPMENTS—AUTOMOTIVE

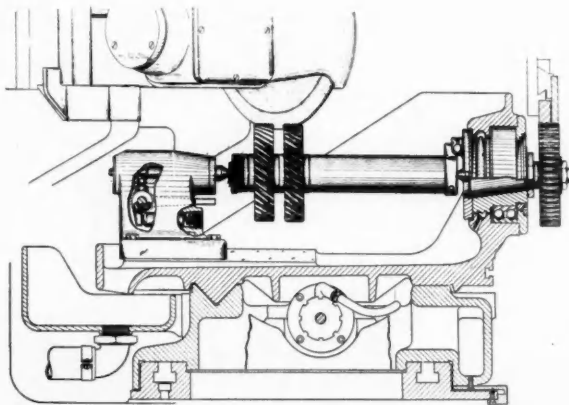
P & W Hydraulic Helical 10-in. Gear Grinder

A RADICAL development in precision gear grinding is promised by the recent introduction of the 10-in. P. & W. hydraulic helical gear grinder, a development of the Pratt & Whitney Co., Hartford, Conn. It is claimed that this machine will grind gear teeth with an accuracy of



-0.0002 in. for spacing, and tooth profile. Tests made with gears ground on this machine show that a pair of mating gears is absolutely silent under all conditions, even while the centers are moved apart or brought together so as to stall the testing machine.

The operating principle of the Pratt & Whitney hydraulic helical gear grinder is simple and accurate. A reciprocating horizontal ram, somewhat similar to that of a horizontal shaper, carries the grinding wheel back and forth through the teeth, generating the adjacent sides of two teeth at once. The wheel is trued with straight sides and top, corresponding with the shape of a tooth in a master rack. The stack of gears being ground is rolled past the reciprocating wheel under the guidance of a master gear and



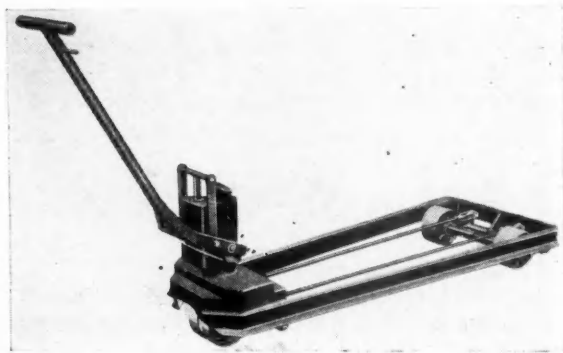
rack, so that the wheel always engages the work tooth for tooth as the master rack engages the master gear. The wheel makes as many passes per tooth as are necessary for the finish desired. The work is indexed automatically when it has rolled to one side out of engagement with the grinding wheel. The machine stops automatically when all teeth are finished.

One of the most important features of the machine is a wheel-dressing device having three diamonds, one in each of three sliding bars. The wheel is dressed so that its periphery is that of a straight-sided involute rack. Another detail which contributes largely to the accuracy of the machine is that the gear blanks are mounted on a massive arbor held on centers so that the work is rigidly supported.

The capacity of the machine is 10-in. maximum pitch diameter, and 3-in. diametral pitch maximum. Spindle speeds of 2215 and 2500 r.p.m. Wheel spindle motor speed 1800 r.p.m. This machine is arranged for motor drive with two 3 hp. A.C. or D.C. motors. Floor space required is 66 x 82 in. Net weight 5400 lb. approximately.

Lyon Hydraulic Lift Truck

THREE inch vertical lift and a capacity of 6000 lb. are features of the new hydraulic lift truck recently placed on the market by the Lyon Iron Works, Greene, N. Y. Other features are: full



turning radius (360 deg.); full operating radius; and balanced handle. This truck is available in two platform widths, 17 in. and 26½ in. Other sizes can be furnished when desired.

Lanchester Autoblaster

A SIGNALLING device, which automatically gives a warning signal whenever the brakes of an automobile are applied so as to produce a very high rate of deceleration, is being manufactured in England by Lanchester's Laboratories, Ltd., Birmingham. Export sales of this device are controlled by J. A. Nagtegaal, 25 Mathenesserdijk, Rotterdam, Holland. The object of this

PARTS, ACCESSORIES AND PRODUCTION TOOLS

signalling device is to automatically give a warning signal in case of an emergency, when the driver is fully occupied in applying the brakes and holding the steering wheel so as to prevent or correct a skid. It relieves the operator, in case an accident should occur, of the charge that he did not sound his horn.

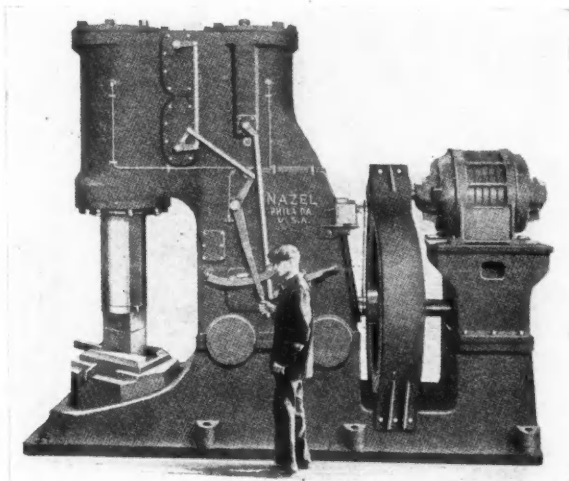
Apparently the device is operated by an inertia device which is mounted on the running board of the car and makes an electrical contact closing the circuit through the battery and horn when the car is suddenly retarded. When the brakes are applied normally the autoblast does not function.

Acorn Nuts

ONE-PIECE acorn nuts are now being manufactured by the Acorn Nut Co., Detroit, Mich., from solid bars of steel by an improved patented process of blind tapping. This method makes possible quantity production at moderate cost. Extreme accuracy of threads is one of the features claimed for this new process. The solid construction has advantages over two-piece acorn nuts in its greater strength, extra tap depth and durable finish.

Nazel Type "F" Power Hammer

FIVE power hammers for general forging ranging in capacity from $4\frac{1}{2} \times 4\frac{1}{2}$ in. to 13×13 in. have been placed on the market by the Nazel Engineering & Machine Works, Philadelphia, Pa. The speed of the machine ranges from 180 blows



per minute on the smaller machine to 100 blows per minute on the larger machine. Floor space required ranges from 93×36 in. to 176×70 in. Motor drive ranges from 10 hp. to 75 hp.

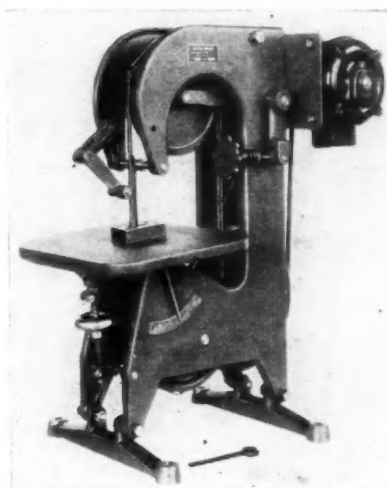
An interesting feature of these machines is the increased clear working space above and around

the anvil block. The space between the dies has been made equal to the full stroke of the ram since the die does not disappear into the ram guide.

Grob Model B-1 Continuous Filing Machine

TO fill the need for external or internal filing of small medium size work requiring fitting or forming, a bench type continuous hand filing machine, Model B-1, has been added to their line by Grob Bros., West Allis, Wis. Provision has been made for flat work up to 4 in. in height thus making this machine available for tool and die making where close tolerances are required.

Among the features of design are: automatic tension to the main driving belt; positive drive



to the file chain; full support back-rest for the file; and a combination of three filing speeds. A channeled link is securely welded to the back of the files providing a means of connecting the files together as well as permitting a positive alignment with the back-rest. The channeled links form a chain of the self-locking type.

The driving motor is $\frac{1}{4}$ hp. capacity mounted at the rear of the machine and driving by V-belt to the main drive pulley. Floor space required is 15×15 in. and the net weight is 150 lb.

Improved Car Pulling Unit

COMPACT, economical, and easily operated, the Weller Capstan Car Puller is now available in an improved design.

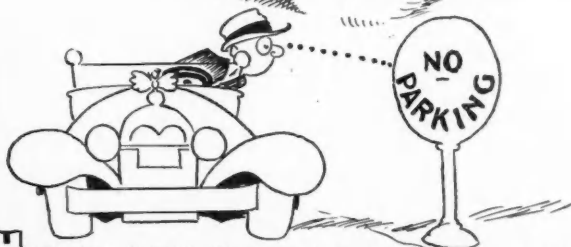
Regularly built in three sizes to handle from one to six 80-ton cars, this electrically operated unit is self-contained, weatherproof, and designed to pull cars, trucks, etc., at any angle. Bulletin No. 1128-GA contains complete description. Sent upon request to The Webster and Weller Mfg. Co., 1856 N. Kostner Ave., Chicago.

Automotive Oddities—By Pete Keenan

KARIN THUNBERG IS SWEDEN'S MOST DARING RACE DRIVER. She also runs an automobile school for mechanics.



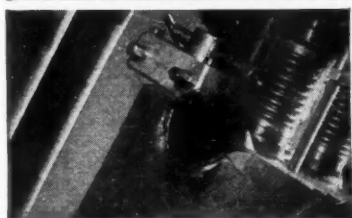
A 25 YEAR OLD CAR WITH STERLING SILVER FITTINGS, ONCE OWNED BY MRS. POTTER PALMER, CHICAGO SOCIAL LEADER, IS STILL RUNNING.



HARLEY WILSON OF KANSAS CITY COULDN'T FIND A PLACE TO PARK HIS CAR SO HE GAVE IT AWAY.

EXACT CAUSE OF FUEL KNOCK IS STILL UNKNOWN TO SCIENTISTS.





NEWS

OF THE INDUSTRY



April Output Continues Gain

Reaches Highest
Point in 10 Months

NEW YORK, May 6—Automobile production during April reached the highest level for the last ten months, according to the preliminary estimate announced by the National Automobile Chamber of Commerce, placing the output for the month at 348,909 units.

The estimate places the production of companies belonging to the chamber at 231,017 units, an increase of 20 per cent over March.

According to this estimate, March production was the highest in the last eleven months, and also only 12 per cent under chamber members' output for the same month in 1930.

The chamber's estimate for the whole industry indicates a 21 per cent increase over the March output.

Marmon Reports Loss

INDIANAPOLIS, May 6—Report of Marmon Motor Car Co. and subsidiaries for year ended February 28, 1931, shows net loss of \$2,915,707 from operations after depreciation and interest, but before special reserves, and net loss after providing for special reserves amounting to \$775,000, of \$3,690,707.

Dodge Deliveries Gain

DETROIT, May 6—Passenger retail deliveries of the Dodge Brothers Corp. for the week ending April 24 showed an increase of 6.1 per cent over the preceding week, while the first three weeks of April produced 48.4 per cent increase over the same period in March.

Buick Deliveries Gain

DETROIT, May 6—The retail deliveries for April of the Buick Motor Car Co. were 32 per cent ahead of March.

APRIL 30, the new Firestone plant in Argentina turned out its first tire cured in the regular production process . . . formal opening of plant soon . . . capacity about 1000 tires, tubes daily * * * Commander George Pearson Glen Kidston, British aviator, was killed during the week and Flight Lt. H. R. D. Waghorn, 1929 Schneider Trophy winner, was badly injured in another crash * * * the Dodge Marathon Eight has traveled 85,000 miles to date . . . started last July to wear itself out * * * the General American Tank Car Corp. has begun placing newspaper copy for institutional benefit of railroad transportation * * * the Buick Apprentice Shop has completed its first year of operation . . . 22 lads enter the second year class, having completed first year successfully * * * fifty students from Battle Creek College visited the Dodge plant April 24 * * * the Dalai Lama, ecclesiastical ruler of Tibet, has ordered an automobile sent to him . . . car will be delivered to Lhasa, which is way up in the Himalayas. There are roads (they call them that) part of the way. But 30 coolies have been designated to carry the car in pieces over the inaccessible parts of the route to Lhasa. When it arrives, a specially trained Chinese chauffeur has been designated to drive it. The Tibetans, heretofore, have called all automobiles seen on infrequent excursions "devil wagons" in their childlike idiom. The Dalai Lama, bless his crimson (?) robes, believes that if he rides around in one of the infernal machines the existing prejudices of his people will be broken down.

Wonder what salesman sold him the car . . . wonder what kind of a car it is says h.h.

THE
NEWS
TRAILER

Signor Acutis, the president of the Bureau Permanent International des Constructeurs d'Automobiles, is now in this country attending the sessions of the International Chamber of Commerce



GIUSEPPE ACUTIS

G. M. Declares Both Dividends

Stettinius Made
a Vice-President

NEW YORK, May 6—Directors of General Motors Corp., at their meeting today, declared on the common stock regular quarterly dividend of 75 cents a share, payable June 12, to stockholders of record May 16. The regular quarterly dividend of \$1.25 a share was declared on the \$5 preferred stock, payable August 1, to stockholders of record July 6.

Present officers were reelected for another year. Edward R. Stettinius was elected a vice-president.

Five States Report

PHILADELPHIA, May 7—April registrations of new passenger cars were 26 per cent under the same month last year in the first five states to report. The increase over March, however, appears to be of about normal seasonal proportions. In this group of states, Ford was off 44 per cent from April, 1930; Chevrolet 1 per cent, and all other makes combined 19 per cent behind. The five states which have reported to date are: Delaware, Illinois, North Dakota, South Carolina and Utah. In 1930, these states provided 8.3 per cent of total passenger car registrations.

Goodyear Increases

AKRON, May 6—The most optimistic note sounded in the rubber industry in more than a year came this week with the announcement by the Goodyear Tire & Rubber Co. that they had taken on 800 additional men and stepped up production to 60,000 casings daily.

Ainsworth Mfg. Co. stockholders elected the following directors at the annual meeting May 5: Charles H. Ainsworth, Louis D. Obolton, Herman Ely, Raymond J. Purdy, William R. Pratt, Jr. All officers were reelected.

Southwestern Rails Permitted Reductions in Tariffs on Hauling of Cotton to Ports

By L. W. Moffett

WASHINGTON, May 7—Approval was given last Monday by the Interstate Commerce Commission to railroads in the Southwest to immediately reduce rates on cotton from origin points to Texas seaports to meet motor truck competition. This action was taken to emphasize the recognition by the commission of inroads motor trucks are making on rail traffic and practically to permit the railroads to fix their own rates so long as the rates are "reasonably compensatory," are subject to suspension and investigation, and that they shall not apply to a distance beyond 500 miles.

The opinion of the commission is supplementary to its report in connection with its investigation of the general rate structure under the Hoch-Smith congressional resolution. This is the first formal decision permitting rate reductions to meet motor truck competition.

In approving lowered rates on cotton, the commission said:

"This record shows that the transportation of cotton to the Texas ports by motor truck, which has developed during the past few years, has made severe inroads upon the traffic and revenues of the respondents, which they can ill afford to stand. This truck competition exists in only a portion of the Southwestern territory covered by the original report, but in the portion where it exists it constitutes a material change from the conditions in the light of which the original report and order were made."

It is pointed out in the report that "in view of the unstable character of the truck rates, and the intangible nature of the truck competition, we are not disposed to impose definite restrictions and limitations of a general character upon the establishment of truck competitive rates with respect to the minimum below which the rates may not go."

The Southwestern carriers already have put into effect, on less than statutory notice, reduced rates on cotton to Texas ports to offset motor truck competition, but when the commission's order in the general cotton revision case becomes effective, the rates would manifestly be returned to a level comparable with the former basis. The order just issued makes exceptions in cases, such as those involved in the instant proceedings, so that where truck competition is reasonably severe, the lower truck-competitive rates will be allowed without respect to the general revised rates made in the original report.

It is declared in the commission report that "the transportation of cotton by motor truck in quantities sufficient to be of material concern to the respondents has developed only within the past two or three years, but with

the construction of new roads and the improvement of old ones, it has increased by leaps and bounds so that at the present time it has become a grave menace to the rail carriers and has resulted in what they describe as desperate.

"From small beginnings the trucks have grown to be a major factor in cotton transportation. Exhibits of record show that during the season 1930-31, to and including Jan. 31, 1931, of all the cotton arriving at the Texas ports, 1,138,935 bales, or 24.25 per cent, were transported by truck, and a railroad witness estimated that within the territory in which the trucks are active they are getting fully 50 per cent of the business."

It was testified that the rates charged by the trucks from north Texas territory range from \$2 to \$2.50 per bale. Roughly, rail rates are double the truck rates. The railroads estimate that if all the cotton moved by trucks during the 1930-31 season had moved by rail at the standard rates they would have received a revenue from this source of about \$2,800,000, and that if it had moved by rail at the truck-competitive rates it would have produced a revenue of approximately \$2,000,000. In addition, the railroads estimated that the revenue which they received on cotton which actually moved by rail at the truck-competitive rates was approximately \$1,000,000 less than they would have produced on this particular traffic at the prescribed rates.

The reduced rates are to apply until June 25, 1932, when the commission will again pass upon them as to whether they shall or shall not be continued.

Rails' Petition Granted

WASHINGTON, May 7—Following upon the heels of its decision permitting Southwestern railroads to reduce rates on cotton to meet motor truck competition, the Interstate Commerce Commission on Tuesday formally approved the request of these carriers to greatly reduce rates on passenger automobiles for hauls up to 500 miles. The proposed schedule of reduced rates on passenger automobiles was published in *Automotive Industries* of May 2, page 709. Permission to establish this schedule of rates was requested in a petition of Feb. 5, 1931, filed with the Commission by the Southwestern carriers, and it was anticipated that the petition would be granted.

It was made a part of a decision in the Consolidated Southwestern cases. In order to grant the request, the Commission vacated previous findings of undue prejudice and preference covering prescribed relationships of rates.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for *Automotive Industries*

NEW YORK, May 6—Rains and cold weather had an unfavorable influence on retail trade last week, while wholesale and jobbing trade and general industry showed no improvement. The decline on the stock market had the effect of depressing the commodity exchanges, and commodity prices on the whole declined.

DEPARTMENT STORE SALES

Sales of department stores in the New York Federal Reserve district during March were 1.7 per cent below those a year ago, while sales of store chains were 3.6 per cent below.

CAR LOADINGS

Railway freight loadings during the week ended April 18 totaled 760,002 cars, which marks an increase of 22,068 cars above those during the preceding week, but a decrease of 132,704 cars below those a year ago and a decrease of 245,878 cars below those two years ago.

COTTON CONSUMPTION

World consumption of American cotton during March amounted to 977,000 bales, as against 904,000 bales during February, and 1,062,000 bales in the corresponding period last year. Consumption during the eight months ended March 31 totaled 7,358,000 bales, as against 9,167,000 bales in the corresponding period last year.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended April 25 amounted to 2,422,600 barrels, as against 2,422,000 barrels for the preceding week and 2,590,100 barrels a year ago.

COAL PRODUCTION

Production of bituminous coal during the week ended April 18 amounted to 6,313,000 tons, as against 8,103,000 tons during the corresponding week last year, while production of Pennsylvania anthracite totaled 1,373,000 tons, as against 818,000 tons a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended May 2 stood at 73.1, as against 74.0 the week before and 74.6 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended April 29 were 21 per cent below those a year ago.

STOCK MARKET

The stock market last week was again under pressure, with violent fluctuations and sharp reductions in prices. Most issues declined to the low level of prices reached during the break last December, while some declined even further. New low levels for the year were made by 493 stocks, while only 15 recorded new highs for the year. Call money remained unchanged at 1½ per cent.

BROKERS' LOANS

Brokers' loans in New York City during the week ended April 29 declined \$114,000,000, clearly reflecting the vast amount of liquidation. There were declines in total loans under each of the three categories.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended April 29 showed increases of \$20,000,000 in holdings of discounted bills and of \$18,000,000 in holdings of bills bought in the open market. The reserve ratio on April 29 was 84.0 per cent, as against 84.5 per cent a week earlier, and 84.6 per cent two weeks earlier.

Steel Prices Continue to Lag

Announced Advances Not Generally Effective Our Observer Finds

By William Crawford Hirsch

NEW YORK, May 7—Volume of automotive demand for steel continues to furnish the principal support of the market. Finishing mills are operating at about the same rate as last week. The \$1 per ton advance in the price of hot rolled steel bars which was to have become effective on May 1, can hardly be said to have become operative so far.

Some consumers specified against lower-priced contracts before May 1, and are now covered for their current requirements while others are said to have been granted extensions to May 15. While some business in cold-rolled strip steel is being done at 2.25 cents, Pittsburgh or Cleveland, the 2.15-cent price generally quoted in the Detroit market has spread.

Price advances announced by wire products mills in March have not come into force, buyers having been accorded opportunity to extend contracts. While these proposed advances did not refer to manufacturers' wire, the tone of the market for the latter is affected by these developments.

In the sheet market hopes are entertained that the changes in the method of quoting initiated by one of the prominent rolling mills and since followed by one of the large specialists in full-finished automobile sheets, will result in a more sound price structure. Purchasing agents do not dispute the contention of most steel producers that prevailing selling prices are in many instances below cost, but so long as there are sellers at these levels, buyers are compelled to protect themselves against their own competitors underbuying them. What pressure on prices there is results directly from efforts of producers to lift their operating rates.

Pig Iron—Automotive foundries are buying in a routine way. The Michigan price continues to be \$17.00 @ \$17.50. The Valley quotation is \$17.00 for both foundry and malleable.

Aluminum—Fair automotive demand is noted with prices unchanged.

Copper—While prices for which twentieth century records hold no parallels were quoted in the last few days there was no business at these subnormally low levels. They were largely the result of bear maneuvers on the London Metal Exchange. The producers' price at the beginning of the week was 9 1/4 cents del. Conn., and 9 1/2 cents del. Middle West. Second hands are said to have offered metal at 9 cents, but transactions at that level in which consumers were buyers could not be traced.

Tin—Straits tin was quoted at 22 1/2 cents at the beginning of the week. This was the first time in twenty-nine years that Straits prices dropped to below 23 cents.

Joint Show Group Named

NEW YORK, May 5—The joint show committees of the Motor and Equip-

ment Association and the National Standard Parts Association have appointed a single committee consisting of E. T. Satchell, president of the M.E.A.; C. M. Burgess, president of the N.S.P.A., and W. R. Crow and W. G. Hancock, representing the M.E.A., and L. H. Dall and V. C. Anderson representing the N.S.P.A.

This committee will have complete charge of plans for the joint show to be held in Atlantic City, N. J., the week of Dec. 7.

Graham Enters Canada

DETROIT, May 4—The Graham-Paige Motors Corp. has announced that it has acquired a building at Walkerville, Ont., and will produce Graham passenger cars there as soon as machinery and equipment can be installed.

Arthur Krueger, who will be managing director at the Walkerville plant, states that the Canadian plans call for the company to build its own bodies in Canada. N. S. Reed will be factory manager. The building is three stories high and has somewhat more than 61,000 sq. ft. of floor space.

Gemmer Enters Canada

DETROIT, May 4—The Gemmer Mfg. Co., manufacturer of worm and roller and worm and sector type steering gears, has established manufacturing operations in Canada, according to an announcement by E. P. Hammond, president.

The plant is located in Walkerville, Ont., and among other manufacturers it will supply all the gears for the Ford Motor Co. of Canada, Ltd., which supplies the Dominion and all British possessions throughout the United Kingdom.

Keystone Gets Army Order

NEW YORK, May 5—Keystone Aircraft Corporation, a subsidiary of Curtiss-Wright Corporation, has received an order from F. Trubee Davison, Assistant Secretary of War for Aeronautics, for 64 twin-engined bombardment planes at a total cost, including spare parts, of \$1,920,510.

Twenty-five of these planes are the air corps type, each equipped with Pratt & Whitney 575 hp. engines, and 39 are each equipped with two Wright Cyclone 575 hp. engines.

Reelect G. M. Directors

WILMINGTON, DEL., May 5—At the annual meeting of the stockholders of General Motors Corporation held here today, the directors were reelected for the ensuing year.

The stockholders approved the formal amendment to the certificate of incorporation to eliminate all reference to the 6 per cent preferred, 6 per cent debenture and 7 per cent preferred stocks, none of which are now outstanding.

Italian Show is National in Tone

Few Foreign Makers Participate in Annual Event at Milan Fair

MILAN, April 23 (by mail)—Forming a part of the Milan Fair, the annual Italian automobile show had a strong national element, the few foreign firms being Packard, Cord, Nash and Ford, with Rolls-Royce and Austin for England and Graf & Stift representing the Austrian industry.

Fiat took advantage of this exhibition to reveal its new model 522, a six-cylinder of 153 cu. in. displacement, announced to sell on the home market at 26,900 liras with five-passenger sedan body. The new car which, it is understood, has been designed to meet Ford competition, is largely on American lines. The engine, of 72 by 103 mm. bore and stroke, is L-head, with a seven-bearing crankshaft of 1.88 in. diameter, developing 55 hp. at 3500 revolutions. It has cylinders and crankcase in one casting, pressed steel oil pan, battery ignition with Morelli distributor, a vibration damper, and one-piece belt driving the combined fan and water pump and the electric generator.

Alfa Romeo has produced a straight eight sports and racing model, of 140 cu. in. piston displacement. Its outstanding feature is central drive for the two overhead camshafts and for all the accessories.

Lancia has produced a sports edition of his eight-cylinder Dillambda with independently sprung front wheels.

Since the Paris show Bianchi has modified his straight eight, among the changes being the use of a Stromberg downdraft carburetor. Power has been increased from 76 to 86. Passenger car manufacturers in Italy are now ten in number, including the Citroen assembly plant.

In the truck section the feature is the production of two Diesel engined Fiats, one with a four-cylinder engine in a 4-ton chassis, and the other having a six-cylinder engine in a 6-ton chassis. Alfa Romeo is producing a 6-ton truck under Bussing license with Deutz six-cylinder Diesel engine. The O. M. Company is building a 6-ton truck with six-cylinder Diesel engine under Saurer license.

Kinney Adds Road Oiler

NEW YORK, May 5—Kinney Manufacturing Company, Boston, Mass., has recently brought out a new Kinney Junior road oiler. This apparatus is built in two sizes—to have capacity of either 250 or 350 U. S. gallons of tar for heating and spreading on road surfaces. The company has also developed a separate engine driven road oiler.

Century Lines Set Record

CHICAGO, ILL., May 4—Century Air Lines carried 5013 passengers in the first 30 days of operation, L. B. Manning, vice-president and general manager of the company, said today. This is believed to be a record for any American air line for a similar flying period.

Men of the Industry and What They Are Doing

De Soto Shifts Three

A number of new executive appointments were announced by Byron C. Foy, president of De Soto Motor Corp., last week.

P. C. Sauerbrey has been named vice-president in charge of manufacturing. Mr. Sauerbrey has been factory manager of the Plymouth division plant and as such, has been in charge of De Soto production since the consolidation of the manufacturing of these two companies at the Plymouth plant. He continues as vice-president in charge of manufacturing for Plymouth Motor Corp.

N. F. Hadley has been named chief engineer for De Soto. Mr. Hadley, until some time ago, was in the central engineering division at Highland Park, and recently has been confining his attention to the problems concerned with De Soto and Plymouth. He has been a member of the Chrysler engineering staff almost since its inception.

B. R. Secord, formerly manager of Chrysler Motors Parts Corp., Dayton, Ohio, has been appointed director of service. As such he succeeds Milton Pulford, who has been appointed to the staff of J. L. Kenyon, vice-president and general manager of the Parts Corp. since this division has been moved to Highland Park.

Lampe Addresses Dealers

Waldo Lampe, statistician for Graham-Paige Motors Corp., spoke in New York, May 4 before a group of approximately 100 Graham-Paige dealers and salesmen, emphasizing the fact that the automotive business is one of the fundamental businesses of the country and one in which the substantial merchandiser will stand a greater chance of making money than in other lines of business. He predicted that the replacement market alone during the next five years will amount to 17,500,000 vehicles.

Chrysler Promotes Lee

R. K. Lee, formerly experimental engineer, Chrysler Corp., has been promoted to director of research for the corporation. Mr. Lee's developments along the lines of rubber engine mountings are now used on a majority of passenger cars in this country.

Chrysler Engineers Elect

Howard E. Maynard was formally installed as president of the Chrysler Engineers' Club at a supper dance given by that organization Friday, May 1, in the Engineering Build-

ing of the Dodge Brothers main plant.

Mr. Maynard succeeds H. T. Woolson, retiring president. Other recently elected officers are: A. G. Hereschoff, vice-president, succeeding George B. Allen; E. E. Orcutt, secretary, succeeding H. C. Kelly, and E. W. Upham, member at large, succeeding G. W. Hubbard.

Willys Elects

At the annual meeting of the stockholders of the Willys-Overland Co., held in Toledo, the following directors were elected: John N. Willys, chairman; C. O. Miniger, George M. Jones, Marshall Field, Charles F. Glore, Rathbun Fuller, Gordon M. Mather, Thomas H. Tracy, L. A. Miller, J. H. Gerkens, and T. A. Russell.

The following executive committee was elected by the directors: C. O. Miniger, chairman; George M. Jones, Charles F. Glore, Rathbun Fuller, Gordon M. Mather, and L. A. Miller. Officers of the company were reelected.

Leisenheimer Returns to U.S.

Slow but steady improvement in European economic and industrial conditions is seen as a present reality by Henry J. Leisenheimer, vice-president and export manager of the Cleveland Tractor Co., who has just returned from a two months' business trip to Great Britain and the Continent of Europe.

Conway Goes to Grand Rapids

J. H. Conway, manager of parts and service division of De Vaux-Hall Motors Corp., has taken up headquarters in Grand Rapids. Mr. Conway has been associated with Norman De Vaux since 1916 when De Vaux was president, general manager and half owner of the Chevrolet factory located in California.

Rolls Elects Inskip

J. S. Inskip has been elected president of Rolls-Royce of America, Inc., in place of Henry J. Fuller, who continues as chairman of the board of directors. Mr. Inskip at the beginning of this year succeeded W. E. Hosac as vice-president in charge of sales, with office in New York.

Murray Goes to Europe

Arthur T. Murray, president of American Bosch Magneto Corp., sailed last week for Europe aboard the S.S. Europa, accompanied by Mrs. Murray.

Durant Drops Legal Action

Injunction Against Canadian Company Dissolved by Consent

LEASIDE, ONT., May 4—Injunction proceedings instituted by Durant, Inc. (Michigan), with the object of preventing the participation of Durant Motors of Canada, Ltd., in a new organization to be known as Dominion Motors, Ltd., have been dissolved by mutual consent of the parties involved, according to Roy D. Kerby, president of Durant of Canada. Mr. Kerby's statement says:

"We are to retain exclusive rights as previously to Durant and Rugby, but the former management contract has been cancelled, leaving the Canadian Company entirely free to institute its own manufacturing and selling policies and to deal, if it sees fit, with other American companies for the manufacture and sale in Canada of other products."

It is understood that there will now be no hindrance to plans of Dominion Motors to proceed with plans for the manufacture of Nash and Durant passenger cars, and Rugby trucks in the present Leaside plant of Durant of Canada.

Ford Revises Victoria

DETROIT, May 6—Victoria types of the Ford Motor Co.'s de luxe line of vehicles are now coming off the assembly line with metal rear-quarters and roof side-panels, instead of the fabric quarters and panels heretofore used. The price of the body type remains unchanged at \$580, list, with special colors of wheels optional at an extra cost.

Laudick Leaves Buick

Louis W. Laudick, for 15 years manager of the Buick Motor Co., Washington, D. C., branch, has resigned. Mr. Laudick stated that he needed an extended rest, and on May 13 he will sail abroad with Mrs. Laudick. No announcement has been made of his successor.

Ainsworth is Named

American Standards Association has appointed Cyril Ainsworth as assistant secretary, succeeding F. J. Schlink, who has resigned. Mr. Ainsworth will supervise the association's 43 safety code projects.

Chrysler Names Marsh

The appointment of M. U. Marsh as head of the car order department of Chrysler Sales Corp. has been announced by J. W. Frazer, general sales manager.

Ford Production Rises in April

World Figure Shows it at Highest Point Since Last July

DETROIT, May 5—World production of Ford cars and trucks in April totaled 117,891, the biggest monthly output since July, 1930. The April total compares with an output of 99,035 cars and trucks in March this year and 205,213 in April a year ago.

Ford production thus far this year amounts to 357,217 cars and trucks against 628,885 in the same period last year. Steady increases have been made each month with the following monthly totals: January, 55,182; February, 85,109; March, 99,035; April, 117,891. Comparable figures last year were: January, 100,927; February, 148,160; March, 174,585; April, 205,213.

Continues Diesel Work

WASHINGTON, May 4—The Packard Motor Car Co. is continuing its experiments with Diesel type aircraft engines, and is at present conducting an endurance test of these engines in Florida, Alvan Macauley, president of the company, told a representative of *Automotive Industries* today. Mr. Macauley was in Washington to attend the conference of N.A.C.C. directors with President Hoover, and other government officials. The Diesel engine experiments were interrupted by the death of Captain Woolson, Packard experimental engineer. Mr. Macauley stated also that he believed that Diesel type engines were making satisfactory progress in airplane, truck, and marine applications.

A.C.F. at Capacity

DETROIT, May 4—A. C. F. Motors Co., manufacturers of trucks and buses, are now on a capacity schedule with some departments operating overtime. Officials say first quarter business considerably exceeded the corresponding period of last year.

On February 1 last all executive offices of the motors division of American Car and Foundry were moved here from New York City. In the last few days A. C. F. delivered 10 motor coaches valued at \$15,000 each to Capitol Coach Lines, Brooklyn, N. Y.

Borg Shipments Gain

CHICAGO, May 4—Shipping schedules of Borg-Warner Corp. currently in effect indicate that May operations will continue the month to month gain, which has been shown since the first of the year. May shipping schedules at one of the company's 10 major units show an increase of 20 per cent over the actual shipments in April.

Financial Notes

United-Carr Fastener Corp. and subsidiaries report net profit for the first quarter of the year as \$1,795 after all charges. This compares with loss for the first quarter of last year of \$20,852.

National Standard Co.'s net income for the six months ended March 31, 1931, showed a 15 per cent gain over the corresponding period of last year, figures released today show. After all charges net income for the six months ended March 31, 1931, was \$249,541, equivalent to \$1.70 a share on 146,536 shares of common stock outstanding. In the corresponding six months to March 31, 1930, net profits were \$216,812, or \$1.44 a share, on 150,000 shares then issued. Net income for the three months to March 31, 1931, was \$177,961, or \$1.21 a share, a gain of approximately 22½ per cent over the March quarter of 1930.

Triplex Safety Glass Co.'s gross profits were within \$8,500 of those for the previous year, according to the annual report just mailed to stockholders.

Great Lakes Aircraft Corp. reports loss for the year 1930 of \$429,400. In addition to this operating loss the company wrote off \$264,847 in adjusting inventories, resulting in a total loss of \$1,258,831, which also included a charge of \$564,584 resulting from reduction of deferred development.

Ford Motor Co. of Canada, Ltd., has declared semi-annual dividend of 60 cents on Class A and Class B stocks respectively, both payable June 20 to holders of record May 20.

Studebaker Corp. has declared regular quarterly dividend of 30 cents on common and \$1.75 on preferred, both payable June 1 to holders of record May 9.

Stutz Motor Car Co. of America, Inc., announces that L. L. Harr and Co., investment bankers, New York City, has purchased a block of over a million dollars of the common stock of the Stutz Motor Car Co.

Thompson Products, Inc., reports earnings of \$56,691 for the month of March, equivalent to two months' dividends. Company also shows reduction of inventory to \$1,061,000 March 31, as against \$1,722,000 March 31, 1930.

Murray Corp. of America reports net loss of \$204,983 for the first quarter of this year, compared with 38 cents a share in the same period of 1930.

Parker Rust Proof Co. has declared regular quarterly dividend of 75 cents on common stock and semi-annual 35-cent dividend on preferred, both payable May 20 to stock of record May 10.

Cologne Plant Opens

DETROIT, May 5—The first car to be assembled in the new Ford plant in Cologne, Germany, left the assembly line yesterday, the Ford Motor Co. was advised in a cablegram today.

The Cologne plant, for which Henry Ford laid the cornerstone last October, has a capacity of 75 cars a day and will employ 1000 men. In addition to assembling cars it will manufacture some car parts heretofore imported into Germany.

Tire Shipments Gain Sharply

Reach Highest Point Since September, 1930, Rubber Assn. Reports

NEW YORK, May 7—Shipments of pneumatic casings for the month of March amounted to 4,121,531, the highest shipment for one month since September, 1930, according to statistics released by The Rubber Manufacturer's Association today. March shipments show an increase of 21.2 per cent over February this year, the seasonal increase being 23.6 per cent.

The organization reports production of pneumatic casings for March to be 4,662,576 units, an increase of 17 per cent over February this year, although 4.1 per cent below March a year ago.

Pneumatic casings on hand March 31 amounted to 10,014,490 casings, an increase of 5 per cent over the February figure of 9,535,650 casings, but 20 per cent below March 31, 1930.

Michigan Sales Reported

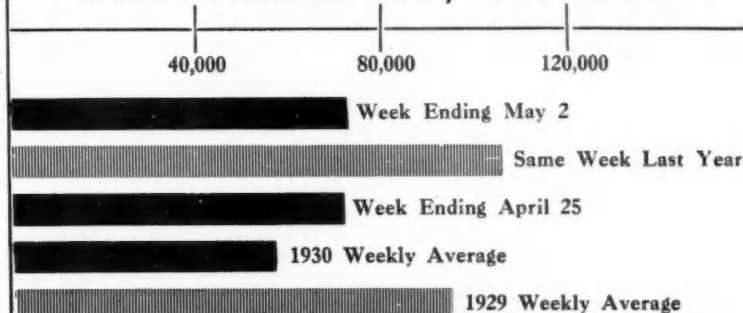
DETROIT, May 6—Michigan new vehicle registrations for March ran about 39 per cent behind last year. Companies showing better than 1930 in the corresponding month include Auburn, Cadillac, Chrysler, Dodge, Nash, Willys-Knight. Ford, with 4011 registrations, showed a 55 per cent decrease. Chevrolet, with 2833, is off 22 per cent. Total March registrations reached 10,758.

Registrations for the year to date were 24,568, divided as follows: General Motors, 41 per cent; Ford, 36 per cent; all others, 23 per cent. Registrations showed Pontiac in third place, Oldsmobile fourth, Buick fifth.

Klingler Sees Increase

DETROIT, May 6—Production of the Chevrolet Motor Co. during the current month will reach at least the total of 106,000 units produced in April, and may reach a final total of 110,000 units, according to H. J. Klingler, vice-president and director of sales.

Automotive Industries Weekly Production Chart



Experiments Combined

Ralph N. Dubois Describes Functions of a Continental Aircraft Engine Department

(Continued from page 722)

gravity forward; and we also provide it with fins at the rear end. If the axis of the arrow deviates from the line of flight ever so slightly, the air resistance and the inertia are no longer in direct opposition to each other, but form a couple which tends to move the axis of the arrow back into the line of flight. If, on the other hand, there were fins or similar devices at the forward end of the body, the couple created by any slight deviation of the axis of the body from the line of flight would tend to increase the deviation, and the motion of the body would be unstable. An example of such unstable motion is that of an airplane falling to earth after having been disabled, with which everyone is familiar through the movies.

This aerodynamic stability is a subject that has not received much attention in the design of passenger cars in the past, because the general form of a conventional passenger car happens to be naturally rather favorable to such stability, the heaviest part of the car, the powerplant, being located near the front, and the highest part of the whole structure near the rear. In the design of cars for attempts on speed records, this factor, however, has called for careful consideration, and to improve their stability it has been necessary to provide them with tail fins.

Moving the powerplant of the car to the rear undoubtedly will have the effect of reducing the aerodynamic stability, especially if at the same time, in order to achieve a streamline effect, the height of the structure is made greatest near the front. Stability can be restored artificially, of course, by extending the body at the rear and providing it with tail fins.

From the foregoing discussion of the points that must be considered in the development of rear-engined cars it will be seen that this type will confront designers with many knotty problems. But the solution of difficult technical problems is the very object of existence of the engineering profession. From one point of view a direct comparison of the features of the rear-engined car, the newer form of which is in its very infancy, with those of the highly developed front-engined car, may seem slightly unfair to the former. Many of the difficulties and disadvantages of the rear-engined design may seem much less formidable after the automobile engineering profession has devoted several years to their elimination.

Probably no other class of automo-

bile technicians are so much interested in a change to cars with rear-mounted engines as are the body engineers. Our body designers deserve a great deal of credit for what they have accomplished during the past decade. Where up to some seven or eight years ago one often heard the remark that for really attractive bodies one had to go abroad, the opposite holds true now, and American bodies have become the models for European designers to pattern after. But their very success has led our designer to a point where further progress along established lines has become exceedingly difficult. If now there should come about a complete reversal of the arrangement of parts on the chassis, body designers could make a new start, and from the earliest designs, which undoubtedly would later be found to be crude and far from perfect, they could naturally evolve a type which would combine streamlining (minimum air resistance), attractive appearance, and comfort in the highest degree.

Wayne Co. Sales Improve

DETROIT, May 4—Registrations of passenger cars in Wayne County during April totaled 5900, an increase of 11 per cent over the total of 5240 for March and a decrease of 37 per cent from the total of 9476 in April, 1930.

Curtiss Gets Export Orders

NEW YORK, May 5—Curtiss-Wright Export Corp. has received orders for seven commercial airplanes from Mexico and one for the Argentine, according to an announcement made by John S. Allard, vice-president of the Export Corporation.

McCann's Adds Model

NEW YORK, May 5—D. E. McCann's Sons, Portland, Me., have developed a new forest fire-fighting apparatus mounted on either Ford or Chevrolet chassis.

Oldberg Schedules Up

DETROIT, May 4—Oldberg Manufacturing Company reports increased manufacturing schedules due to increases in commitments on the part of automobile manufacturers.

Hupp Adds 61 Outlets

DETROIT, May 4—Fifty-nine new dealers and two new distributors signed the Hupmobile franchise in April.

Foundrymen Meet

CHICAGO, May 5—The American Foundrymen's convention opened Monday with more than 3000 foundrymen registering.

Rear Engines May Revive Body Art

P. M. Heldt Continues Discussion of Design Problems of Future

(Continued from page 728)

stops. Valve seat good for 100 hr. of running in 5-hr. periods will go bad in 50 hr. of continuous operation. In establishing the endurance of a new model or major engine change the engine is first operated at rated speed and full throttle, with inspection stops every 5 hr. At 50 hr. a complete tear-down inspection is made, and if the first run is successful, a 50-hr. continuous full-throttle run is started.

To ascertain the effects of high speeds due to power dives on the A70 engine a propeller was trimmed down to allow a speed of 3075 r.p.m., or 1075 r.p.m. above the rated speed of the engine. The procedure was to run at 2000 r.p.m., check the manifold suction and oil pressure, and accelerate to 3075 r.p.m. for a "dive" of $\frac{1}{4}$ min. and then return to 2000 r.p.m., for another check of the manifold suction and oil pressure. After running at almost 3100 r.p.m. the engine seems to be idling when slowed down to 2000 r.p.m. Some 115 of these "dives" were made without other damage than several broken valve springs and retainers.

National Fibres Improves

DETROIT, May 4—National Automotive Fibres, Inc., of Detroit, reports a 90 per cent increase in business in April as compared with March, 1931. L. O. Miller, president of the company, states that the increase is proportioned about fifty-fifty between new business and increase in commitments from body manufacturers using its products in the manufacture of seat cushions.

Murray Adds Workers

TRENTON, N. J., May 5—Considerable progress is being shown by the Murray Rubber Co., which reports that 100 additional men have been put to work at the plant since April 1. The firm has gone into foreign trade, and export branches are now operating in China, Burma and South America.

To Manufacture Tires

TRENTON, N. J., May 4—Newark Tire & Rubber Co. has been incorporated at Trenton to manufacture tires and other rubber products. Thomas J. Lane, John E. Lane and John V. Caulfield, all of 516 Bergen Avenue, Jersey City, are the officers of the new concern.

Scoville Sees Return to Normal

Chrysler Statistician Cites Sales Climb Nearing 5 Yr. Average

DETROIT, May 4—After reviewing the complete returns of motor car sales and registrations from 45 states for the month of March and bringing his charts up-to-date, John W. Scoville, chief statistician of Chrysler Corp. points out that the automobile industry steadily but surely seems to be returning to normal.

Based on a normal business made up from a five year average, the industry had returned to 74.1 per cent of normal at the end of March, Mr. Scoville said. "This shows a continuous improvement every month for the last five months. Figures showing the percentage of normal, beginning with the low point of the industry in 1930, are as follows: November, 47 per cent; December, 61.6 per cent; January 68.2 per cent; February, 72.6 per cent; and March, 74.1 per cent.

"For five months," he continued, "sales have been moving nearer to normal. Production of passenger cars in the United States also has been rising in comparison to normal and in March reached 66.6 per cent."

Franklin Shipments Gain

SYRACUSE, May 4—Shipments of Franklin cars during the month of April were the highest this year, being 31 per cent ahead of March. March in turn was 16 per cent ahead of February, and February was 33 per cent ahead of January, sales executives of the Franklin Automobile Company report. Retail deliveries have kept pace with shipments, it was stated.

Marketing New Lights

NEW YORK, May 4—Pioneer Instrument Company has developed a new type of navigation lights for aircraft service. These lights, designated type 554, are fire-proof, of high visibility, exceeding in this respect Department of Commerce requirements when using 21 candlepower bulbs.

Rubber Exports Decline

NEW YORK, May 4—Exports of crude rubber from Malaya and Ceylon during April totaled 46,940 tons. This compares with 54,802 tons for the previous month and represents the first material decline in exports for several months, according to the Rubber Exchange of New York.

Completing Russian Plant

PHILADELPHIA, May 5—According to an item printed in the Economic Review of the Soviet Union, satis-

factory progress is being made in the construction of the Nishni Novgorod automobile plant, and it is now expected that all building operations will be completed by Aug. 1 next, and that installation of machinery and other equipment will then begin. Last year 30 million rubles were spent on the plant, and this year's expenditures are scheduled at 58 million. During its first year of operation the plant is expected to turn out 70,000 cars, and production will later be stepped up to the maximum capacity of 140,000 cars per year.

Motor Stocks Decline

NEW YORK, May 4—Seven representative motor stocks showed a decrease in stock market valuation of \$155,938,000 during April, according to Frazier, Jelke & Co., New York bankers. This is a decrease of 6.8 per cent and is a part of a general decrease in 100 representative stocks chosen from varied groups of 10.4 per cent. Groups which decreased in value more than motors include oils, 10.8 per cent; amusements, 24.7 per cent; railroad equipment, 18.3 per cent; steels, 16.3 per cent; chemicals, 14.1 per cent; mines, 12.5 per cent; electrical equipment, 11.6 per cent; utilities, 10.6 per cent; foods, 8.1 per cent, and rails, 7 per cent. No group showed any increase during the month, but merchandising securities and miscellaneous industrials showed a slighter drop than did motors at 4.7 and 4.6 per cent respectively.

Lempco to Expand

BEDFORD, OHIO, May 4—At its last meeting the board of directors of Lempco Products, Inc., manufacturer of replacement brake drums, axle shafts and worms and gears, authorized a plant extension involving a \$250,000 expenditure.

Auburn Shipments Jump

AUBURN, IND., May 4—Auburn Automobile Co. shipped 6003 Auburn and Cord cars in April, a new high figure in the company's history.

This brings the total number of units shipped by Auburn since Jan. 1 to 17,723, which is 4030 more cars than the company built and delivered during the year of 1930.

Hupp Sells 3000

DETROIT, May 4—Hupmobile production and sales for April were approximately 3000.

Buick Produces 13,931

DETROIT, May 4—During April Buick Motor Co. produced 13,931 units.

Retail Paper Volume Down

Average Financing Per Car Drops to \$536 in March

WASHINGTON, May 4—One hundred and two thousand seven hundred ninety-two new automobiles were financed for the retail trade during the month of March, according to data reported by the Bureau of the Census, based on reports supplied by 428 financing organizations. The volume of this business reached \$55,080,642, compared with a volume of \$77,301,645 reached during March, 1930, in the financing of 139,320 new cars. Average paper carried per car dropped in March to \$536, compared with \$555 in March of the previous year.

Wholesale financing volume for the month was reported to reach \$63,024,137, compared with \$77,547,813 for March of 1930. Wholesale volume for the first three months of this year, which reached \$153,027,592, compares with a volume of \$191,239,724 for the first quarter of 1930.

Chrysler Changes Six

DETROIT, May 4—Specifications issued by Chrysler Sales Corp. show a number of mechanical changes since the introduction of the Chrysler Six. The ring gears are now 9½ in. diam., and have 46 teeth with a 10-tooth pinion. The clutch is now 10 in. in diameter, against 9 in. formerly. Lining diameters are 9¾ in. outside and 6¾ in. inside. Three forward camshaft bearings are now steel-backed babbitt, with the same dimensions. The Schebler carburetor is changed to a new model, TX-56. The intake silencer is added standard equipment; battery capacity has been increased to 100 amp. hr. Tire section is increased to 5.25. Front tread is increased to 57 5/16 in. and rear to 57 in. The compression ratio is increased to 5.35.

Defiance Reports Profit

TOLEDO, May 4—Defiance Spark Plugs, Inc., reelected directors at annual meeting recently and reported net profit of \$57,691, equal to 84 cents on a share on 67,938 shares outstanding of Defiance Spark Plug Corp., parent company. Sales have shown an increase over first quarter, 1930, and new dealers have been added, giving the company 59,000 dealer outlets.

District Sales Set Record

WASHINGTON, May 7—Establishing an all-time record, 2987 deliveries of automobiles were made in April by District of Columbia dealers. This exceeded by 406 the previous record of 2581 made in March, 1929, and by 503 the March total of 2484.

World Equivalent Wage Survey Sponsored By Ford Motor Co. is Nearing Completion

WASHINGTON, May 8—Placing Ford Motor Co. employees throughout the world on a purchasing power parity apparently is near accomplishment.

This is indicated by the announcement of Secretary of Labor Doak that the collection of data for the equalization of wages in the Ford plants throughout the world to conform to the standards of living of the Ford employees in Detroit has been substantially completed. Commissioner Ethelbert Stewart of the Bureau of Labor Statistics sailed for Geneva, Switzerland, on the George Washington, May 6, to attend a conference of the government statisticians for the 12 countries concerned to put the material into final form for report.

The question submitted by Mr. Ford was what wages his companies would have to pay in the 17 cities in which he had, or contemplated establishing, plants, so that the employees in each of these cities would be able to maintain an equivalent standard of living to that of the company's employees in Detroit. The 17 cities for which information was desired were: Manchester, London, Cork, Paris, Marseilles, Berlin, Frankfurt, Antwerp, Rotterdam, Helsingfors, Copenhagen, Stockholm, Trieste, Genoa, Barcelona, Warsaw and Constantinople.

The survey was made by the Bureau of Labor Statistics in the early part of 1930. The purpose was to obtain detailed data regarding the living con-

ditions and expenses of a representative number of Ford employees in Detroit who were maintaining a family on the company's minimum wage of \$7 per day. The report gives not only the average cost of each item in the family budget but also, as far as possible, gives a description of each item and the quantity purchased, so that the cost of this budget in each of the foreign cities may be obtained by "pricing" each of the quantity items, and totaling the results to give a fair weighting.

The International Labor Office conducted this "pricing" survey and with the cooperation of the governments involved has completed the work in all countries, except Italy, which will be included later. The final conference has been called for May 20 in Geneva, and will be attended by Commissioner Stewart.

"This inquiry entirely reverses the old theory of real wages," said Secretary Doak, "which was to take the wages paid in various localities and find their relative purchasing power in those localities—the method only emphasized the differences. The so-called Ford study takes the purchasing of a wage group in a definite locality and finds the corresponding wages necessary to be paid in other localities to maintain the given living level. The study has attracted a very intense interest in each of the 12 countries involved."

Bus Tire Impact Studied

WASHINGTON, May 4—Impact forces produced by the rear wheels of a modern bus operating on a concrete pavement at various speeds up to 55 m.p.h., and over two types of road obstruction, have been studied recently by engineers of the Bureau of Public Roads. The studies covered various wheel loads, sizes of tires, inflation pressures, rim dimensions and rim widths. The Rubber Manufacturers Association and the Society of Automotive Engineers cooperated in the investigations.

The tests revealed that the impact varies in almost direct proportion with the tire-inflation pressure. The variation of impact with speed proved to be different for the two types of impacts, the shock impacts, which are produced when the wheel hits the obstruction, and the drop impact, when the wheel hits the pavement after the bounce. The drop impact reached a maximum at comparatively low speeds and decreased at higher speeds. The shock impact varied almost directly with the speed, but did not attain a value as great as that of the drop impact until a quite high speed was reached.

Sees Coordination Gains

DETROIT, May 4—It is inevitable that railroads enter the motor transportation business on a nation-wide scale, P. W. Hood, vice-president of the Timken-Detroit Axle Co., believes.

"The only logical solution lies in intelligent coordination of rail and highway transportation, and the railroads obviously are best situated to carry out such a plan.

"It seems most likely that new types of haulage units will be developed to meet these needs. Most authorities, who have studied the various questions involved, agree that heavy-duty units will be required, rather than a multiplicity of light vehicles."

Sears Adds Tire Line

CHICAGO, May 4—Sears, Roebuck & Company, mail order and chain store firm, has announced introduction of a new automobile tire into its line, as a companion to the "Allstate." The tire is offered in six and four-ply, and side walls are built to withstand wear and tear along curbs. This brings the Sears tire lines to four.

Budd Production Increases

NEW YORK, May 4—Edward G. Budd Mfg. Co. produced 54 per cent more in April than in March, according to officers of the company. Production has been increasing consistently since Jan. 1 and officials state that the April output was greater than any month since May, 1930.

French Exports, Imports Slump

Former Item Registers the Largest Decrease

WASHINGTON, May 3—France imported during 1930 a total of 7879 automobiles, either complete or as chassis (including 6007 passenger cars and 1872 commercial vehicles), as compared with a total of 9592 during 1929—a decrease of about 22 per cent, according to advices received in the Department of Commerce from the automotive trade commissioner to Europe, W. L. Finger. In addition approximately 75 per cent of the parts for about 13,500 automobiles were imported for assembly in France, the remaining parts to be purchased locally. Those assembled cars added to the number of complete cars or chassis make a total of 18,004 vehicles, complete and in parts, received by France during 1930.

The value of the complete vehicles imported in 1930 amounted to 332,151,000 francs (about \$13,288,040), 11 per cent more than the 229,000,000 franc valuation in 1929—the increase resulting partly from larger imports of parts of an American make and partly to higher values a unit, for the number of complete automobiles, and the total number, complete and in parts, imported in 1930, is smaller than for 1929.

French exports of complete units and chassis numbered 31,158 units—22,557 cars and 8601 commercial vehicles, as compared with 49,025 total units in 1929—a decrease of 37 per cent. In addition, parts for assembly for about 8000 vehicles (6000 cars and 2000 trucks, all Citroen) were exported, the upholstery and woodwork, as a rule, being purchased in country of assembly. Thus the total number of automobiles, complete and in parts, numbered 39,158 as compared with 61,325 in 1929. The total value of the 1930 exports was 1,115,481,000 francs, or approximately \$44,619,240, as compared with 1,577,897,000 francs, or \$63,115,880 the previous year, or a decrease of 29 per cent.

Reo Reports Loss

DETROIT, May 4—Reo Motor Car Co., and subsidiaries, has reported net loss of \$420,832 for quarter ended March 31, compared with net loss of \$175,437 same period last year, and with net profit of \$537,514 in the first quarter of 1929.

Charles W. Greening

TOLEDO, May 4—Charles W. Greening, connected with the Toledo Machine and Tool Co. for more than 30 years, died April 29, after a lingering illness.

Bus Merger Joins 12 Lines

W. H. Vanderbilt Heads New System Operating in East

NEW YORK, May 4—Completion of the consolidation of 12 major bus transportation systems, serving practically every city and town in the Central Atlantic and New England States, operating its own service as far west as Chicago and St. Louis, and south to Norfolk, Va., and with traffic arrangements with other bus companies to cover the remainder of the country, was announced today by William H. Vanderbilt, president of the Coastal Transit Co., on behalf of the Short Line System, the new organization.

The consolidation brings the Short Line into being as the largest bus trunk line system east of the Mississippi.

The plan consolidates passenger bus lines operating a total of 400 inter-city passenger buses. Road mileage of the routes thus aligned totals 5856 miles, which is comparable to a major railway network. The companies consolidated are all established lines, having operated from periods of from a year and half to six years.

Officers of Coastal Transit Co. have been named as follows: William H. Vanderbilt, president; F. J. Scarr, executive vice-president; Charles E. Crocker, secretary and treasurer. The board of directors has been constituted as follows: Chairman, William H. Vanderbilt; directors, Paul T. Babson, Eric H. Biddle, C. M. Sears, Jr., and F. J. Scarr.

Illinois Sales Improve

CHICAGO, May 4—Sales of new automobiles in Illinois during April totaled 17,004, according to the Illinois Chamber of Commerce. This figure, the chamber announced, is an increase of 5421 over March sales, which amounted to 11,683 cars. It represents a decrease of 5412 cars from April, 1930, sales of 22,416 cars. April, 1931, was the fourth consecutive month in which sales of new cars in Illinois have registered an increase over previous months.

William L. Bryant

SPRINGFIELD, VT., May 4—William LeRoy Bryant, president of the Bryant Chucking Grinder Co., died suddenly April 25.

After leaving college Mr. Bryant became associated with the Jones & Lamson Machine Co., ultimately becoming their chief engineer. In 1909 he left Jones & Lamson to form the Bryant Chucking Grinder Co. He was a member of the A.S.M.E. and the S.A.E.

Gasoline Consumption in 46 States Increased 5.9 Per Cent in February

NEW YORK, May 4—Gasoline consumption in 46 states and the District of Columbia for the month of February, 1931, as indicated by reports made by wholesalers and dealers in the various states under provisions of the gasoline tax laws or gasoline inspection laws, totaled 871,720,000 gal., compared with 823,230,000 gal. in February, 1930, an increase of 48,490,000 gal., or 5.9 per cent. Daily average consumption for February, 1931, was 31,133,000 gal., compared with a daily average of 29,755,000 gal. in January,

1931, an increase in daily average during February of 4.6 per cent, according to the American Petroleum Institute.

Gasoline consumption in 46 states and the District of Columbia for the two months ending with February, 1931, amounted to 1,794,115,000 gal., compared with 1,654,795,000 gal. for the corresponding period of 1930, an increase of 139,320,000 gal. for the period, or 8.4 per cent increase in the figures showing daily average consumption.

GASOLINE CONSUMPTION BY STATES

	Tax per Gallon Cents	Jan., 1931 Gallons	Month of Feb., 1931 Gallons	Feb., 1930 Gallons	2 Months Ending With Feb., 1931 Gallons	Feb., 1930 Gallons
Alabama	4	12,575,000	11,501,000	13,073,000	24,076,000	26,294,000
Arizona	5	5,850,000	5,356,000	6,255,000	11,206,000	12,190,000
Arkansas	5	11,752,000	10,122,000	9,277,000	21,874,000	20,198,000
Colorado	4	12,037,000	11,488,000	10,358,000	23,525,000	20,322,000
Connecticut	2	13,641,000	12,405,000	13,005,000	26,046,000	25,821,000
Delaware	3	2,258,000	2,642,000	1,743,000	4,900,000	4,149,000
D. of C.	2	6,489,000	60,046,000	5,116,000	12,535,000	10,568,000
Florida	6	22,221,000	21,261,000	21,933,000	43,482,000	43,945,000
Georgia	6	17,093,000	15,772,000	16,691,000	32,865,000	34,124,000
Idaho	5	2,943,000	2,907,000	3,195,000	5,850,000	5,772,000
Illinois	3	65,609,000	68,461,000	57,307,000	134,070,000	115,021,000
Indiana	4	31,976,000	29,697,000	27,670,000	61,673,000	57,273,000
Iowa	3	27,814,000	26,403,000	23,980,000	54,217,000	48,361,000
Kansas	3	26,815,000	24,559,000	25,392,000	51,374,000	47,114,000
Kentucky	5	12,396,000	11,088,000	10,189,000	23,484,000	20,237,000
Louisiana	5	13,847,000	13,101,000	13,265,000	26,948,000	27,389,000
Maine	4	4,441,000	3,849,000	3,328,000	8,290,000	6,851,000
Maryland	4	12,337,000	11,650,000	10,764,000	23,987,000	21,573,000
Massachusetts	2	33,001,000	29,952,000	29,884,000	62,953,000	60,199,000
Michigan	3	52,644,000	46,269,000	47,153,000	98,913,000	94,189,000
Minnesota	3	28,269,000	24,701,000	21,249,000	52,970,000	43,380,000
Mississippi	5	†10,060,000	†9,200,000	9,537,000	†19,260,000	20,133,000
Missouri	2	34,011,000	31,053,000	27,351,000	65,064,000	55,085,000
Montana	5	4,159,000	4,092,000	2,457,000	8,251,000	5,511,000
Nebraska	4	*16,334,000	17,695,000	14,936,000	34,029,000	30,481,000
Nevada	4	1,070,000	1,119,000	1,049,000	2,189,000	1,978,000
New Hampshire	4	2,959,000	2,787,000	2,738,000	5,746,000	5,365,000
New Jersey	3	36,813,000	35,134,000	32,626,000	71,947,000	65,264,000
New Mexico	5	3,594,000	3,422,000	3,668,000	7,016,000	7,075,000
New York	2	98,946,000	91,404,000	85,675,000	190,350,000	177,652,000
North Carolina	5	20,045,000	18,564,000	20,818,000	38,609,000	42,058,000
North Dakota	3	6,298,000	4,977,000	3,553,000	11,275,000	6,600,000
Ohio	4	63,371,000	66,749,000	60,412,000	130,120,000	122,527,000
Oklahoma	4	23,448,000	22,605,000	21,631,000	46,053,000	41,785,000
Oregon	4	10,290,000	10,961,000	9,577,000	21,251,000	16,654,000
Rhode Island	2	5,988,000	5,227,000	5,239,000	11,215,000	10,320,000
South Carolina	6	8,987,000	8,489,000	8,350,000	17,476,000	17,153,000
South Dakota	4	8,906,000	7,634,000	7,831,000	16,540,000	15,493,000
Tennessee	5	15,036,000	14,007,000	13,643,000	29,043,000	27,690,000
Texas	4	61,059,000	54,653,000	56,422,000	115,712,000	110,647,000
Utah	3½	3,750,000	3,526,000	3,517,000	7,276,000	7,223,000
Vermont	4	2,124,000	1,804,000	1,697,000	3,928,000	3,490,000
Virginia	5	15,653,000	14,443,000	13,341,000	30,101,000	27,715,000
Washington	3	16,431,000	17,235,000	15,776,000	33,666,000	30,112,000
West Virginia	4	8,028,000	7,800,000	6,977,000	15,828,000	14,102,000
Wisconsin	2	26,879,000	25,718,000	21,929,000	52,597,000	44,373,000
Wyoming	4	2,143,000	2,192,000	1,653,000	4,335,000	3,339,000
Total		922,395,000	871,720,000	823,230,000	1,794,115,000	1,654,795,000
Daily Average		29,755,000	31,133,000	29,401,000	30,409,000	28,047,000
Increase over previous year:						
Amount of Increase			48,490,000		139,320,000	
Percentage Increase in Daily Average.			5.9%		8.4%	

* Estimated.

† Revised.

Receives New Planes

PHILADELPHIA, May 4—Imperial Airways, Ltd., the British subsidized air-service corporation, has recently taken delivery of the first of four four-engined seaplanes specially designed for the Mediterranean section of the India and South Africa mail service. The boats have a maximum speed of 132 m.p.h. and a cruising speed of 100 m.p.h. The four engines are rated at 555 hp. for an altitude of

5500 ft. Provisions are made for carrying 18 passengers, a crew of three, and 3550 lb. of mail, baggage and equipment, which together with 12,410 lb. of gasoline, gives a total weight of plane and load of 30,310 lb. The wing span is 113 ft., and the passenger cabin, which has large rectangular windows, measures 14 ft. in length, 8 ft. 9 in. in width and 6 ft. 6 in. in height. The four seaplanes were built by the Rochester seaplane works of Short Bros., Ltd.

Aero Standards Set for Approval

Will be Acted Upon at Forthcoming S.A.E. Summer Meeting

At a meeting of the Aircraft and Aircraft Engine Divisions of the S.A.E. Standards Committee in Detroit on April 17 and 18, action was taken on a number of proposed standards which will be placed before the Standards Committee as a whole at the forthcoming summer meeting of the Society. These comprise a revised series of tire sizes, including tires for airplane tail wheels and additional sizes for landing wheels; tables of sizes and detail dimensions of round and streamline tubing of both steel and aluminum; brazier-head rivets and round shear nuts; a revised standard for splined crankshaft ends for mounting propellers, with the addition of a No. 50 shaft-end in the present standard for larger engines and of a No. 00 taper shaft for small engines.

The Ball and Roller Bearings Division has prepared a series of annular ball bearings of the narrow, light type of comparatively large diameter, for use where lightness rather than high load capacity is of importance, the series ranging from a bearing of 10 mm. bore, 32 mm. outside diameter and 9 mm. width, to one of 110 mm. bore, 185 mm. outside diameter and 22 mm. width. These bearings have been turned out by bearing manufacturers for a number of years. The Division is also working on light, medium and heavy series of metric-size thrust ball bearings of the single-direction, double-direction and self-aligning types, these series representing a modernization of the lists of such thrust bearings now published by the Society.

A subcommittee on Standard Procedure for Testing Rubber Products of the American Society for Testing Materials, on which the S. A. E. is represented, is considering some changes in this procedure. The time after completion of the vulcanization during which tests are to be made is to be limited to 60 days, and the duration of the test is to be limited to 24 instead of 48 hours. The maximum room temperature to which rubber products are to be brought for test is 90 deg. Fahr., and the article must be held in air of room temperature at least 1 hr. instead of 3 hr. as formerly. It is thought that this will require better air-conditioning in a number of the plants manufacturing mechanical rubber goods. The load on the thickness-testing gages was changed from 9 oz. plus or minus 1 oz. to 9 oz. plus or minus 1/10 oz. One of the more recent items taken under consideration by the Committee is the developing of a standard test for V-type fan belts.

Duncan Keith

CHICAGO, May 4—Duncan Keith, vice-president, Burgess Battery Co., died last week, after a heart attack. He was 53 years old. Mr. Keith is survived by his widow, a daughter and his mother. He was a member of the Union League, Old Colony and Commonwealth clubs.

AC Employees on Full Time

DETROIT, May 4 — Employees of AC Spark Plug Co. are now on a full-time employment basis, consisting of nine hours daily, five and a half days a week, it was learned today.

May 9, 1931

+ + CALENDAR + + OF COMING EVENTS

SHOWS

International Garage Exposition, Berlin, Germany May 9-Aug. 9

CONVENTIONS

International Chamber of Commerce, Washington, D. C. May 4-9

S.A.E. Spring Production Meeting, Milwaukee May 7-8

American Gear Mfg. Assn., Buffalo, New York May 7-9

Associated Business Papers, Hot Springs, Va. May 11-13

American Society Mechanical Engineers, Baltimore May 12-14

American Roadbuilders Assn., Washington May 15

Automotive Engine Rebuilders Assn., Chicago May 18-21

American Society Mechanical Engineers, State College, Pa. May 22

Retail Delivery Assn. Convention, Washington, D. C. May 25-28

National Foreign Trade Council, New York May 27-29

Natl. Automobile Chamber of Commerce, New York City (Directors' Meeting) June 3

Natl. Automobile Chamber of Commerce, New York City (Members' Meeting) June 4

S.A.E. Summer Meeting, White Sulphur Springs June 14-19

Steel Founders Society (Mid-Summer), French Lick, Ind. June 17-19

National Association of Credit Men, Boston, Mass. June 22-27

American Society Mechanical Engineers, Madison, Wis. (Oil and Gas Power Meeting) June 23-26

National Association of Taxicab Owners, Chicago, Ill. June 29-30

S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio Sept. 1-3

Eastern States Exposition, Springfield, Mass. Sept. 20-26

American Welding Society, Boston, Mass. Sept. 21-25

National Safety Council, Chicago, Ill. Oct. 12-16

Society Industrial Engineers, Pittsburgh, Pa. Oct. 14-16

Transportation Meeting, S.A.E., Washington, D. C. Nov. 10-12

See Improved Exports

NEW YORK, May 9—Improved conditions in the export sale of automotive replacement parts, garage equipment and accessories are reported in connection with the second international merchandising campaign of the Overseas Automotive Club. The campaign material, which is based on the growing demand for service and maintenance work in the millions of automobiles in operation, is now being mailed to 9000 automotive wholesalers, agents and representatives throughout the world.

Murray Corp. Reelects

DETROIT, May 4—At the annual meeting of Murray Corp. of America, directors and officers were reelected.

Battery Makers Hold Meeting

Discussion Covers Wide Field, Including Several Technical Papers

National Battery Manufacturers Association, Inc., held a two-day convention at Niagara Falls, Canada, on Thursday and Friday, April 23-24. Papers delivered at these meetings included discussions of uniform cost accounting systems, selling activities and technical phases of the industry.

H. D. Wilson of Prest-O-Lite Storage Battery Corp. discussed the effect of free wheeling on batteries, E. H. Shubert, National Lead Co., discussed storage battery performance, Howard B. Klippel, American Hard Rubber Co., discussed battery containers and Gene Handler, Lyons Storage Battery Co., discussed the industry in general.

In sales activities, Lou Talkes, Cleveland Storage Battery Co., discussed "Selling Batteries in These Times"; Frederic Williams of Philadelphia discussed "Thinking Sales"; C. W. Weirs, advertising manager of Spirella Co., discussed "Letters I Have Met"; and Dr. A. P. Sy of the University of Buffalo, discussed "Taking the Bunk Out of Advertising."

Commercial Reports Income

BALTIMORE, May 4—Consolidated report of Commercial Credit Co. and subsidiaries for the first quarter ended March 31, 1931, shows net operating income of \$1,767,660, available for interest and discount charges of \$899,211. This compares with \$2,831,940, available for interest and discount charges of \$1,604,872 for the whole year 1930.

Lycoming Ships to Williams

WILLIAMSPORT, PA., May 4—First shipments of UA Lycoming marine engines to the Williams Piano Co., Oshawa, Ont., for use in their 16-ft. runabout boats, have been made by Lycoming Mfg. Co., Charles F. Loew, sales engineer, marine division, announced today.

American Sets Record

BALTIMORE, May 4—American Hammered Piston Ring Co. has announced that during April it was necessary to increase the working force and production 20 per cent over January figures, setting an all-time sales and production record for the company.

Budd Wheel Sales Increase

NEW YORK, May 4—Budd Wheel Co. reports an increase in sales during April of 20 per cent over those during the month of March.

Automotive Industries